

A GENERAL SYSTEMS APPROACH TO THE ANALYSIS OF MANAGERIAL FUNCTIONS

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CHAPTER I

INTRODUCTION

This dissertation is concerned with the analysis of managerial functions. At the outset it is imperative to have the admission of a respected management scholar:

Virtually every author has to define the meaning in which he is using the most ordinary terms or risk being attacked by some other writer who is using the same word in a totally different meaning. . . .¹

Anyone seeking to determine what is meant by the term "management" will encounter a plethora of definitions. Swick notes that "management" has been defined as

. . . a function, a process, structures, a part in the organization, methods, principles, techniques, persons, knowledge, relations, a mental attitude, a collection of elements, an art, a science, a group of activities, a phase of an undertaking, a force, a group of people, an activity, and an output.²

In this study, the term "management" will be used to refer to that body of knowledge about the activity of managing; "managing" to refer to the process of getting things done through the efforts of

¹L. F. Swick, "The Problem of Management Functions," California Management Review, Vol. 1, No. 4 (Spring, 1960), p. 70.

²Ibid. For some of these definitions, see: George E. Terry, Principles of Management, 3rd ed., Homewood, Illinois, Richard D. Irwin, Inc., 1948, pp. 34-35; and A. E. Lane, The Management Dictionary, New York, Exposition Press, 1961, pp. 234-235.

other people; and "manager" to refer to any individual who is engaged in the activity of managing.³

The analysis of managerial functions, the focal point of this study, thus refers to the delineation of these functions, or tasks, generally performed by managers.

The "Traditional Approach" to the Analysis of Managerial Functions

Historical Development⁴

Consistent with the development of management theory attempts have been made to trace its origins. A moment's reflection, however, reveals the necessity of this task. If a fundamental assumption—that the function of managing is implicit wherever one encounters people organized to attain some objective—is true, then it can be concluded that in every generation some effort must have been made in the direction of an analysis of managerial functions.

³Collectively these individuals will be referred to as "managers" or "the managers," thereby maintaining the ubiquitous use of the over-worked term "management." Except as it may be used in a very few quotations included in this study, the term "management" is used here as defined above.

⁴Native works have been devoted to the history of management thought. In particular, see George F. Gilbreth, *Industrial Management and Its Development*, rev. ed., Houghton, Mifflin, Richard S. Davis, Ed., 1937; L. F. Urwick (ed.), *The Golden Book of Management*, London, George Allen, Ltd., 1944; L. F. Urwick and L. F. L. Bryson, *The Making of Scientific Management*, Vol. II, Houghton Mifflin, rev. ed., London, Sir Isaac Pitman & Sons, Ltd., 1947; and John F. Ross, "A History of Twentieth Century Management Thought," doctoral dissertation, The Ohio State University, 1959.

An examination of the literature in management theory from the Industrial Revolution to World War II reveals that two distinct streams of thought existed. One tended to explain the routine physical activities of men used as subjects to machines in production. The other focused on the departmentalization of organizations resulting from the division of labor and the resultant problems of coordination. The first of these may be called the "Scientific Management School"; the second, the "Administrative Management School."³

Scientific Management School.—Of all the contributors to management thought before the advent of the twentieth century, Charles Babbage (1791-1871) of Great Britain is generally recognized as the earliest thinker on scientific management.⁴ Babbage was essentially a scientist, mainly interested in mathematics. While working on the development of his "Difference Engine," a mechanical device for calculating numerical tables, he began a study of factories and machinery in general. This led Babbage to publish an essay in 1832, On the Economy of Machinery and Manufactures. Rather than a technical description of industry, it is concerned with the use of machines and the organization of human beings for that purpose. Thus, his work, written from the standpoint of a trained scientist, is a management study in which he points out the possibility of developing general

³For a discussion of the characteristics of each "school," see James G. March and Robert A. Simon, Organizations, New York, John Wiley & Sons, Inc., 1958, pp. 15-16.

⁴This discussion is based on March and Simon, pp. 15-17.

principles based on scientific analysis to govern the conduct of industrial undertakings.

It is this detachment, this use of experience, his faith in the possibility of applying scientific processes of thought to the organization of industry, which constitute Lilliput's unique contribution to the advancement of management.⁵

However, it is Frederick W. Taylor (1856-1915), whose major work was published almost eighty years later, who is universally recognized as "The Father of Scientific Management." He is not awarded this title because his work was original or isolated.

What Taylor did was not to invent something quite new, but to synthesize and present as a reasonably coherent whole ideas which had been permeating and gathering force in Great Britain and the United States throughout the nineteenth century. He gave to a disconnected series of initiatives and experiments a philosophy and a title. . . .⁶

Taylor, born in Philadelphia, had received a liberal education before accepting an apprenticeship in a small machine shop in 1875. Three years later he took a job with the Midvale Steel Works as a machine shop laborer, and was successively promoted to the position of chief engineer. While at Midvale, Taylor sought to establish, through a series of carefully conducted experiments, "the best and cheapest way" for performing various productive tasks. He was intent upon applying scientific methods to the problems of shop management. "The best management is a true science, resting upon clearly defined

⁵Ibid., p. 26.

⁶Ibid., p. 27.

laws, rules, and principles on a foundation.¹¹

His views on the duties of managers of industrial operations reflect his primary interest in defining "a fair day's work" and "a fair day's pay" for that work.

First. They develop a science for each element of a man's work which replaces the old rule-of-thumb methods.

Second. They scientifically select and then train, teach and develop the workman, whereas in the past he chose his own work and trained himself as best he could.

Third. They heartily cooperate with the men in so to insure all of the work being done in accordance with the principles of the science which has been developed.

Fourth. There is almost equal division of the work and the responsibility between the management and the workman.¹²

While Taylor sought fundamental principles applicable to all kinds of human activities, he concentrated on the mechanical aspects of work—that has come to be known as time and motion study. Thus, from the point of view of the development of an analysis of managerial functions, Taylor's contribution consists of:

1. his emphasis on the application of the scientific method to management problems;
2. his recognition of the importance of proper selection and training of both workers and managers; and
3. his concept of "functional foreman," emphasizing the need

¹¹Frederick W. Taylor, Principles of Scientific Management, New York, Harper & Bros., 1911, p. 7.

¹²Ibid., p. 64.

for specialization on the managerial level.

Following the publication of Taylor's book (1911), there developed an entire school of Scientific Management, motivated by the increasing demands of industry for more efficient methods of production. These men tended to concentrate on pathology, rather than on the analysis of managerial functions.¹¹ This task was taken up by those individuals in the Administrative Management School, the founder of which is now recognized as Henri Fayol.

Administrative Management School.—Henri Fayol (1868-1948) of France has received belated recognition as "The Father of Modern Management Theory."

The work of the Frenchman, Fayol, constitutes one of the greatest contributions to the field of management and administration. . . . He devoted his life to getting better into management. . . .¹²

Although his now famous work, General and Industrial Management, first appeared in French in 1916, little attention was given it in the United States and England for several years. This delay may be traced to (1) the criticism of American and British management scholars for the work of Taylor and his followers, and (2) the lack of

¹¹These comments are not meant to minimize in any way the substantial contributions which have been made by Taylor's successors. Certainly interest in Scientific Management continues as strong today as in Taylor's day. Current work in operations research and simulation are logical extensions of his pioneering work. However, the true origins of the "traditional approach" to the analysis of managerial functions are to be found in the work of the Administrative Management School.

¹²Flippo, p. 188.

general distribution of an English translation of Fayol's book between 1948.¹⁸

Fayol, after a formal education as a mining engineer, became associated with the Compagnary-Fourchambault mining company in 1888. He held a series of engineering and administrative positions until 1918, when he was named managing director (president) of the company.

When he took charge this enterprise was on the verge of bankruptcy. When he retired [1918] its financial position was irreparable. It had made a contribution of the greatest value to the national effort in the First World War, and it had an administrative, technical and scientific staff drawn throughout Europe.¹⁹

Fayol had written his book as a practical narrative reflecting upon a successful career. He felt that his success was attributable to the principles which he had observed and employed; that these could be considered in a logical, scientific scheme.

The most important part of his book from the standpoint of this study is his analysis of managerial functions, which he called the "elements of management."

¹⁸This discussion is based on French's foreword to the English translation of Fayol's book *General and Industrial Management*, trans. George Horne, London, Sir Isaac Pitman & Sons, Ltd., 1948. Previous English translations of Fayol's work had appeared. In 1908, the International Management Institute (Geneva) published a translation by J. A. Chaboussou. In 1927, a translation of one of Fayol's papers by Sarah Green, "The Administrative Theory of the State," appeared in: Arthur Galick and L. French (eds.), *Essays on the Science of Administration*, New York, Institute on Public Administration, 1927. Earlier, Miss Green had presented this translation at the International Congress of Administrative Science (Geneva, 1925).

¹⁹French, *The Golden Rule*, p. 11.

Fayol said that "to manage is to forecast and plan, to organize, to command, to coordinate and to control."¹⁴

The plan of action is . . . the result envisaged, the line of action to be followed, the stages to go through, and the methods to be used.¹⁵

To organize a business is to provide it with everything useful, to the functioning: raw materials, tools, capital, personnel.¹⁶

The organization, having been formed, must be set going and this is the mission of command. . . . For every manager the object of command is to get the optimum return from all employees of his unit in the interest of the whole concern.¹⁷

To coordinate is to harmonize all the activities of a concern so as to facilitate its working, and its success.¹⁸

Control consists in verifying whether everything occurs in conformity with the plan adopted, the instructions issued and principles established. It has for object to point out weaknesses and errors in order to rectify them and prevent recurrence.¹⁹

This analysis of managerial functions, along with his emphasis on the necessity and possibility of teaching management and the universality of managerial principles, represent Fayol's unique contribution to management theory.

General Principles of the Administrative System (1916).—It

¹⁴Fayol, pp. 6-7.

¹⁵ibid., p. 48.

¹⁶ibid., p. 53.

¹⁷ibid., p. 99.

¹⁸ibid., p. 123.

¹⁹ibid., p. 127.

should not be inferred from the above discussion that efforts had not been made in the direction of an analysis of managerial functions in the United States or Great Britain before Fayol's work was popularized (1948). Nor would it be correct to imply that there was no overlap between the Scientific Management School and the Administrative Management School.

The forerunners of the present-day analysis of managerial functions were mainly the results of efforts during the period 1890-1900 to apply the mechanistic approach of the Scientific Management School to the explanation of the process of managing. For example, William F. Craggell, in 1898, was the first to formulate principles of organization and Ralph E. Davis produced a highly integrated and comprehensive analysis of managerial functions in 1903.¹¹ Although both made contributions to the development of management theory, most current writers acknowledge a greater indebtedness to the latter.

With a few exceptions, the majority of the recent work on the analysis of managerial functions has been done by economists. The work of this generation of writers might be referred to as "the

¹¹For a description and evaluation of Craggell's contribution, see: *Enc.*, pp. 179-83. Craggell's most recent revision for *Organization and Management in Industry and Business*, 3rd ed., New York, Ronald Press, Inc., 1947. For Davis, see: *Enc.*, pp. 184-88, 194-98. The latest refinement of Davis' general analysis appears in *Enc.* *The Fundamentals of The Management*, New York, Harper & Row, 1950.

traditional approach.¹² Briefly speaking, the typical textbook on the "principles of management" (which represents an analysis of managerial functions) begins with an attempt to define "management." Next considered is the question, "What functions must the manager perform?" What follows is an exposition of the work of professionals and the particular author's view resulting from personal experience and observations of business enterprises. Having derived "principles of management" in relation to business enterprises, it is next stated that these principles have universal applications; i.e., they may be applied to any type of organization.

Limitations of the Traditional Approach.—It is appropriate to recall the previously stated fundamental assumption: "the function of managing is implicit wherever one encounters people organized to obtain some objective." If this assumption is true, it would follow that the analysis of managerial functions should be applicable to the managers of any human organization. The "traditional approach" has not succeeded thus far in providing such an analysis. This results from

¹²The following are representative of the traditional approach: (1) Louis A. Allen, *Management and Organization*, New York, McGraw-Hill Book Co., Inc., 1949; (2) Ralph C. Davis, *The Fundamentals of Management*, New York, Harper & Row, 1949; (3) Harold Koontz and Cyril J. O'Donnell, *Principles of Management*, New York, McGraw-Hill Book Co., Inc., 1948 (2nd ed., 1954); (4) Milton E. McPhee, *Management, Organization and Planning*, New York, Macmillan, 1949; and (5) George L. Terry, *Principles of Management*, Homewood, Illinois, Richard D. Irwin, Inc., 1949 (rev. ed., 1949; 3rd ed., 1948).

the inherent limitations of the approach.

First, the traditionalists have not distinguished between true principles which identify cause-and-effect relationships and/or facts, and collections of recommendations about what practice should be. It is often difficult to tell whether the presentation is meant to be a description of reality or a prescription for the future.

Second, the validity of the traditional approach and/or its conclusions has not been demonstrated, either logically or empirically. A careful reading of any of the current textbooks in "principles of management" will reveal examples of conclusions which do not follow from assumptions; or, the more basic methods, assumptions which can only lead to a breakdown of the analysis.²² In some cases, it will be

²²The following may be considered as examples. (1) A manager is anyone who performs the five functions of a manager; viz., planning, organizing, staffing, directing and controlling. Staffing comprises those activities essential in securing, and in keeping secured, the managerial positions in the organization. (Harold Koontz and Cyril O'Donnell, Principles of Management, New York, McGraw-Hill Book Co., Inc., 1958, pp. 33-35.) It would then follow that for someone to be a manager he must have a manager for a subordinate, but at the lowest managerial level (usually the foreman) the subordinates are not managers. Therefore the foreman is not a manager, nor is his superior, nor is his superior's superior. Koontz quoted in the organizational hierarchy the president of the firm is not a manager. This seems quite unrealistic. (2) An organized enterprise requires at least two managers on the same level or in a superior-subordinate relationship. (*Ibid.*, p. 36.) If this assumption is accepted, any group of individuals with a single superior who, in turn, has no superior does not constitute an organization. Can an individual who is the head of a "non-organizational" organization? Apparently not. Thus it would be necessary to conclude that the single superior is not a manager. However such an individual is in every other way a manager and elsewhere in the text is viewed as such. (*Ibid.*, pp. vii-viii.)

found that the assumptions are not explicitly stated, further frustrating attempts to criticize logical consistency of the presentation.

The lack of empirical validation has been extensively commented upon by March and Simon:

The great bulk of this wisdom and lore has never been subjected to the rigorous scrutiny of scientific method. The literature contains many assertions, but little evidence to substantiate by the usual scientific standards of public verifiability and repeatability—whether these assertions really hold up in the world of fact.²⁴

A third limitation of the traditional approach, closely related to the above, is that acceptability of the approach and its conclusions rests in large measure on frequent repetition by writers in the field and "common sense." This has led one scholar to remark:

As I read the textbooks on business organization, it seems to me that I find mostly a lot of old wine taken, unverified empirically and unsupported theoretically, that are blindly repeated and quoted from one author to the next.²⁵

Fourth, the universality of application sought by the traditionalists is retarded by the very nature of their approach. A typical statement about universality follows:

There exists a systematic body of knowledge that constitutes a core of principles of management that are true to all managerial situations; these principles are applicable whether it is a business organization, a religious organization, a school

²⁴March and Simon, p. 1.

²⁵James Hise, "Toward a Theory of Industrial Organization," *General Problems and Concepts in Management, General Management Series*, No. 175, New York, American Management Association, 1964, p. 14.

on any other type of organization, these principles are true also of all levels of management from the foreman to the chief executive.²⁵

This statement is an excellent example of the way which are "plainly repeated." Any system of principles which exists is systematic only in the sense that the principles have been arranged in some way for orderly presentation. The claim that these principles "are true in all managerial situations" and for "all levels of management from the foreman to the chief executive" cannot be supported. Not even the natural sciences will claim principles which are true in all situations; furthermore, the traditionalists admit that their principles lack the precision of the natural sciences.²⁷ And statements such as the above cannot be reconciled with the definition of principle presented by the traditionalists themselves: "Principles are used here in the sense of fundamental truths applicable to a given set of circumstances . . ."²⁸ The "truth" of the principles has never been established. The applicability of these principles to organizations other than business enterprises is based for the most part on one study.²⁹ Attention is

²⁵Leon C. Megginson, "The Pressure for Principles: A Challenge to Management Teachers," Journal of the Academy of Management, Vol. 1, No. 2 (August, 1958), p. 7. Similar statements will be found in almost every management textbook.

²⁷For example, see: Harold Koontz and Cyril W. Trowel, Principles of Management, 2nd ed., New York, McGraw-Hill Book Co., Inc., 1951, p. 281.

²⁸Ibid., p. xviii. (Italics added.)

²⁹James D. Mooney and A. G. Bailey, Human Relations, New York: Harper & Row, 1961.

the "traditional approach" focuses almost exclusively on very large business organizations. Thus, even a statement on universality has been made, it is ignored! The student seeking insights on managing any other form of organization is left to fend for himself.

Relevance of This Study

The limitations of the "traditional approach" impair its effectiveness and weaken its contribution. The co-author of one of the most popular management textbooks has speculated on the need for change:

There is a question in my mind as to whether enough attention has been given to the development of a conceptual framework of principles from which to approach this important problem of improving management. . . . It seems that greater progress could be made if more attention were paid to the development of a conceptual scheme of management in all its aspects.¹⁰

The objective of this study is to propose an alternative approach to the analysis of managerial functions. If a comprehensive conceptual framework is desired, then it must be developed on the basis of a comprehensive approach. Rather than seeking management universals based on a study of business enterprises, a general (and hence more abstract) model should be developed.

The emerging discipline of General System Theory, which seeks to create a science using common elements found in all systems, can

¹⁰Donald Knutsen, "A Preliminary Statement of Principles of Planning and Control," *Approach of the Academy of Management*, Vol. 1, No. 1 (April, 1968), p. 45.

provide the rudiments for a general model, which can then be used to develop an analysis of managerial functions. More important than the specific contributions which can be "learned" from General System Theory is the influence of its philosophy. As the alternative approach to be proposed in this study is intended to reflect the philosophy of General System Theory, it will be referred to as a "general systems approach."

Meaning is implicit whenever one recognizes people organized to attain some objective. A general model of human organization would be capable of serving as a framework for an analysis of managerial functions. Therefore, the starting point chosen for a general systems approach to the analysis of managerial functions is the construction of a model of human organization utilizing the concept of a system. The model to be used in this study will be referred to as an "organized behavior system."

Beginning with this concept, the study will involve an examination of the relationships which develop within an organized behavior system. From the nature of these relationships and the action which takes place within an organized behavior system, it will then be possible to identify certain members of the system who can be referred to as "managers." An analysis of the functions of these members within this general model of human organization will demonstrate the universality of managing and, at the same time, provide a comprehensive analysis of managerial functions not limited to one type of human

organization.

A general systems approach to the analysis of managerial functions would differ from the "traditional approach" in at least three fundamental aspects. The traditionalists have built their analysis upon a model of business enterprise and then sought to use this limited model as the basis for general statements about the nature of managing. Rather than proceed from the specific to the general, the approach proposed here will reflect a reversal of this process, beginning with the construction of a general model.

The traditionalists have allowed their proprietary orientation to unduly interfere with their analysis. A working premise involved in this study is that a theoretical model should first be rigorously constructed and then modifications can be made for the modifications variations which occur in practice. If the initial model construction attempts to account for all variations, the complexity of the model is unnecessarily increased while the usefulness of the model is reduced.

The claim for universality of analysis propounded by the traditionalists is not interwoven into their analysis. The approach to be taken in this study will seek to utilize the concept of universality both as an initial position and as a continuing criterion for the model construction.

Plan of the Study

The background for a general systems approach to the analysis of managerial functions will be presented in Chapter II, through consideration of the purpose, nature and scope of General System Theory.

The relationship of General System Theory to management and the relationships of both to the social sciences will also be considered to indicate the harmony which exists between the development of General System Theory, the integration of the social sciences and the analysis of managerial functions.

The approach to be presented in this study is based upon the concept of an "organized behavior system" which will be developed in Chapter III. The origin, growth and survival of organized behavior systems will then be considered.

The relationships which tie members together into an organized behavior system will be the subject of Chapters IV and V. In Chapter IV the fundamental aspects of communication and power, along with their interrelationships, will be analyzed. Operating aspects of organized behavior systems, which lead to the creation of sub-systems, and decision systems responsible for the determination of input-output relationships, will be investigated in Chapter V.

Against the background of Chapter II and relying upon the concepts developed in Chapters III, IV and V, an analysis of managerial functions based upon a general systems approach will be presented in Chapter VI.

A summary of the study, the principal conclusions and the implications of the analysis will be treated in Chapter VII.

CHAPTER II

GENERAL SYSTEM THEORY

Purpose of General System Theory

Over the years man had identified and selected various segments of his empirical world for intensive study. As these studies have become more systematic and more rigorous individual bodies of knowledge have developed, each embracing a theory or theories which attempt to explain activity within some particular sphere of man's experience. Eventually these studies have attained the stature of disciplines, the number of disciplines or the scope of each tending to increase with the development of more elaborate techniques for investigating man's environment and experience.

In the course of studying segments of this empirical world, the concept of "system" has occurred to investigators. In attempting to reconstruct a theory, or a systematic arrangement of the accumulated knowledge, there appeared to be some basis, underlying "order" to the phenomena under investigation. Thus, in each of the several disciplines dealing with the empirical world—physics, chemistry, economics, sociology and so on—the notion of system evolved. And, in each of these disciplines, cause-and-effect relationships were identified and formulated into hypotheses, principles, or laws.

Although each discipline tended to work independently, it has been noted that a similarity exists among the concepts and concepts developed. This similarity, along with the growing desire for a unified body of knowledge dealing with the general relationships of the empirical world, has been recognized through the establishment of "General System Theory."²

General System Theory was proposed in 1944 by the biologist Ludwig von Bertalanffy as a "new, basic scientific discipline."³ This discipline is concerned with the formulation and deduction of those principles which are valid for systems in general. A system is "any complex of interacting elements; or, any arrangement or combination, as of parts or elements, is a whole." The generality of this definition is exceeded only by the generality of its use; e.g., the solar system, the economic system, the digestive system.

It is Bertalanffy's contention that

there are principles which apply to systems in general wherever the nature of their component elements or the relations or "forces" between them. The fact that all sciences are concerned with systems, leads to a formal correspondence or logical homology in their general principles, and even in their special laws if the conditions of the systems encompassed in the phenomena under consideration.⁴

²For a discussion of his ideas, which are the basis for much of this presentation, see: "An Article of General System Theory," British Journal for the Philosophy of Science, Vol. 1, No. 1 (May, 1944), pp. 124-33; and "General System Theory: A New Approach to Unity of Science," Human Biology, Vol. 12, No. 4 (December, 1941), pp. 302-41. The first will be cited hereafter as "Articles"; the second, as "Approach."

³Bertalanffy, "Articles," p. 124.

The purpose of General System Theory is to create a science using common elements found in all systems as a starting point. It seeks to identify those general system laws which will apply to any system of a certain type, irrespective of the particular properties of, or the elements involved in, the system.

In an elaboration of Bertalanffy's ideas, Kenneth Boulding comments:

If General System Theory does not seek, of course to establish a single, self-contained "general theory of practically everything" which will replace all the special theories of particular disciplines. Such a theory would be almost without content, and all we can say about practically everything is almost nothing. Somewhere, however, between the specific that has no meaning and the general that has no content there must be, for each purpose and at each level of abstraction, an optimum degree of generality. It is the contention of the General Systems Theorists that this optimum degree of generality in theory is not always reached by the particular sciences. The objectives of General Systems Theory then can be set out with varying degrees of ambition and confidence. At a low level of ambition but with a high degree of confidence it aims to point out similarities in the theoretical constructions of different disciplines, where these exist, and to develop theoretical models having applicability to at least two different fields of study. At a higher level of ambition, but with perhaps a lower degree of confidence it hopes to develop something like a "spectrum" of theoretical systems of systems. . . .

The development of General System Theory can have several beneficial results, in addition to whatever intellectual exercise any result from its construction. The stature of a science or discipline is next

Kenneth E. Boulding, "General Systems Theory—The Skeleton of Science," *Management Science*, Vol. 2, No. 3 (April, 1956), pp. 199-208. Bertalanffy originally proposed the term "General System Theory"; Boulding and others use "General Systems Theory." This difference is noted lest some readers be puzzled or confused by any difference in concept.

often measured by the sophistication, or rigor, of its models. In fact, one of the primary sources of fuel for philosophers of science is in contrasting the relative sophistication of various theoretical models. (Thus, to some, economics with very elaborate models is a "science," while engineering is denied this epithet because of a lack of elaborate model construction.)

As General System Theory approaches its goal of systemic universality it can serve as a vehicle for the advancement of model-building in the specialized disciplines.

The existence of laws of similar structure in different fields makes the use of systems which are simpler or better known as models for the more complicated and less amenable ones. Therefore, General System Theory should be, methodologically, an important means of controlling and investigating the transfer of principles from one field to another, and it will no longer be necessary to duplicate or triplicate the discovery of the same principles in fields isolated from each other.

Furthermore, the evolution of models by its very nature facilitates the identification of "gaps" or omissions and weaknesses in the original, theoretical foundation. The discreet interchange of models, encouraged through General System Theory, would help to identify these gaps.

In addition to directing attention to gaps, General System Theory could suggest methods of filling them. Equationlessly the most difficult problem in the evolution of a discipline is the initial model formulation. After the inadequacies of this model have been identified, however, the problem of how to overcome them recedes.

⁴Cartwright, "Notions," p. 141.

History and Scope of General System Theory

History

General System Theory was first described by its "founder" as "a logic-mathematical discipline, which is in itself purely formal, but is applicable to all sciences concerned with systems."¹ While it is based on the various theoretical constructs of the several disciplines, it is not intended to be simply a conglomeration of the products of other disciplines. General System Theory strives to form a "bridge" between the highly generalized theory of pure mathematics and the highly specialized theories of the specific disciplines.

Pure mathematics consists of a system of highly general relationships expressed in a language free of ambiguity and thereby possessed of great precision. It achieves this quality because it does not yet or have any connection with man's empirical world. The relationships with which it deals can be abstracted from any specific phenomenon or body of knowledge. For example, probability theory can be studied apart from any immediate, observable event. As a formal mathematical discipline it can stand alone. It also can be applied to a number of distinct fields. "Because in a sense mathematics contains all theories it contains none; it is the language of theory, but it does not give us content."²

¹ibid., p. 129.

²ibid., p. 129.

Over the years the application of this "language of theory" has been extended to a growing number of disciplines; e.g., mathematical economics, mathematical biology, mathematical sociology. In the concepts of a discipline are reduced to mathematical terms, and thus freed of the particular discipline's context or jargon, the fundamental conceptual structure becomes both more readily identifiable and more precise. The similarity of the mathematical expression of principles from several different disciplines each dealing with a similar concept (e.g., population, growth) led Bartalski², among others, to seek an explanation for this occurrence.

Thus, similar fundamental conceptions appear in all branches of science, irrespective of whether inanimate things, living organisms, or social phenomena are the objects of study. This correspondence is the more striking because these developments are mutually independent, largely unaware of each other, and based on totally different facts and contradictory philosophies. . . . Not only are general aspects and viewpoints alike in different fields of science; we find also formally identical or isomorphic laws in completely different fields.³

These corresponding conceptions and isomorphic laws are a result of the existence of what the General System Theorists consider to be general system laws, which apply to any system of a given type.

The thought process utilized by the General System Theorists in abstracting the development of their "new science" is seen to consist of the following steps:

1. A large number of disciplines have placed the phenomena

²Bartalski, "Ordines," pp. 225-22.

which occur in their segment of man's empirical world into an orderly presentation employing the notion of a system for their conceptual skeleton.

2. Especially when reduced to mathematical terms, a structural identity or isomorphism of "laws" which serve to explain the operation of those phenomena appears to exist among the various disciplines, although each discipline has evolved independently utilizing its own set of facts and its own philosophy.
3. As a result of (1) and (2) it should be possible to formulate general system laws, which would explain the occurrence of a particular phenomenon in all systems (of a given type), regardless of the component elements of the system.
4. An orderly, systematic body of knowledge about systems can thus be established, which will be called "General System Theory," for that is precisely the subject matter.

In a later presentation of his views, Bertalanffy sought to allay the fears of critics who felt that he was oversteering logical idealization to mathematical expressions of concepts which were only coincidentally isomorphic.

The central point of system theory is the dynamic view, trying to explain phenomena of order in terms of the interaction of processes This model conception, and not the triviality that differential equations can be used to describe

various phenomena, in the meaning of General System Theory.⁸

Therefore, although the "logic-mathematical" approach appears to a certain extent, General System Theory can also be considered as a "doctrine of balance" from a non-mathematical viewpoint.

It is a hypothesis-inductive system of those principles which follow from the definition of system and the introduction of more or less special conditions. In this sense, system theory is a priori and independent of the interpretation in terms of empirical phenomena, but is applicable to all empirical systems concerned with systems. . . . Speaking more precisely, fields of application of system theory are all levels of existence: first, the level of physical; second, of biological; third, of sociological units.⁹

Issues

For General System Theorists to be successful in their efforts to develop a science using common elements found in all systems, the Theory must meet at least two very demanding criteria. One, a formal structure for the science must be developed which will apply coherence and rationality to its existing theoretical constructs. Two, to truly form a "bridge" between mathematics and the several disciplines, it must be successfully rooted in the empirical world.

The scope of General System Theory has already been suggested in the preceding discussion. However, further insight may be gained

⁸ Bertalanffy, "Approach," p. 345. The efforts of Bertalanffy to outline his critics of the primacy of the philosophy of General System Theory vis-a-vis its methodology bears an interesting parallel to the efforts of Frederick M. Taylor to emphasize the essential contribution of Scientific Management to be its philosophy, not its techniques.

⁹ Ibid., p. 354.

through a modification of the approaches to the development of the Theory.

The first approach is to look over the empirical universe and to pick out certain general phenomena which are found in many different disciplines, and to seek to build up general theoretical models relevant to these phenomena. The second approach is to arrange the empirical fields in a hierarchy of complexity of organization of their basic "individual" or unit of behavior, and to try to develop a level of abstraction appropriate to each.²⁰

The "phenomena" approach, and for example should serve to illustrate this approach, which is based on the identification of isomorphic laws regarding such phenomena common to several disciplines.

In almost all disciplines an attempt is made to analyze the interaction of an "individual" with his environment. To the economist the individual is the firm; to the physicist, the atom; to the chemist, the crystal; to the sociologist, social organizations and so on. All empirical disciplines can be said to be involved in a form of ecology, i.e., they study the actual relations of individuals (or identified units) and their environment. Each individual is viewed in terms of behavior or action which is related to his environment. Each individual is thought to consist of many individuals of the next lower class, e.g., social organizations of men. These "sub-units," by means of a description of their structure and arrangement, are used to explain the behavior of the environment-oriented individual.

The analysis of the structural components within the system

²⁰Golding, p. 286. (Section III.)

leads to a consideration of organization, which is an a priori requirement of systems.

We may designate systems as "holons" if they show the property of organization. Here interaction between the parts of a system would not make it a whole, but only such simultaneous reorganization and such interaction as still render it fit for scientific existence.¹²

Interrelated to the "ecological" analysis are several related phenomena. The concept of population is utilized to denote an aggregate of individuals. Movement of individuals into and out of the population forms the basis for studies of population changes, in terms of number and structure; e.g., business failures, mortality tables. In the process of considering these structural-numerical changes, attention is given to interactions among individuals in the system. Here the concepts of competition, symbiosis and/or parasitism find expression.

Another common phenomenon is the growth which takes place within the system. Although many models involve some notion of equilibrium, or balancing of forces, often account must also be taken of the tendency for systems to reach successively higher (or lower) levels and thereby displace the former equilibrium.

A final example of phenomena common to several disciplines is that of organizing. At the human level it is relatively easy to comprehend the existence of a communication network; e.g., in a social

¹²Hartmut E. Ross, "Unity of Nature," Human Relations, Vol. 11, No. 4 (December, 1958), p. 215.

organization. However, communication is not limited to human systems; communication occurs in all systems. For the system to achieve organization and equilibrium, some mechanism for the exchange of information among components must exist or be developed. Even in very simple mechanical systems some device for initiation and termination of action will be incorporated into the design; e.g., an "on-off" switch.

Paradox of the "phenomenon" approach encounters a significant analytical barrier: the high degree of interrelationship and interdependency of the various phenomena makes it extremely difficult to isolate a particular phenomenon for intensive analysis. Hence, it may be more fruitful to utilize another approach to the development of a General System Theory.

The "system of systems" approach.--Some philosophers seeking to create a unity of knowledge have based their efforts on a hierarchy of disciplines; each successive level would be encompassed by a more general discipline. There are several objections to this method, as well as other sizable resistances stemming from the vested interests of the various disciplines. Both may be overcome by the "system of systems" approach to General System Theory. This approach is based on the characterization of the process, not on the characterization of established disciplines.

It is possible to arrange systems on the basis of complexity, the arrangement tending to parallel the complexity of the individuals constituting the system. At each successive level, a more complex individual, or unit, is the subject of inquiry. In each system involves

an analysis of sub-units, the fruits of analysis on one level form the foundation for the next level. This procedure of developing a system of systems would facilitate the interchange of concepts among the several disciplines, without jeopardizing the "intellectual standing" of any one discipline.

Building has suggested such a hierarchy of systems.²² A consideration of his scheme will aid in establishing the scope of General System Theory.

(1) The static structure, or the level of formwork. This primary level of system analysis deals with developing the geography and anatomy of the universe, broadly defined. It includes not only mapping the earth, plotting the solar system and determining the anatomy of plants and animals, but also all efforts towards classifying and cataloging static structures in man's spiritual world. Whatever field of inquiry is chosen, the foundation for further analysis is built upon an accurate description of those static structures which comprise the substance of the field. Without adequate description, functional analysis cannot be accomplished.

(2) The static dynamic system, or the level of diachronia. Systems of this type share the property of *probableness*, necessary motions; e.g., the operation of most machines, the movements of the planets within the solar system. Next analytical structures involving the concept of equilibrium would be included, or at least introduced, at this level.

²²Building, pp. 593-594.

For example, the greatest part of economic analysis relates the impact of various events upon the system in terms of their effects upon an equilibrium position. The analysis proceeds on the basis of the necessary actions which must take place to maintain or attain an equilibrium.

(3) The cybernetic system, or the level of control mechanisms or thermostats. Although similar in some respects to the simple dynamic system, this type of system differs in that any chosen equilibrium can be maintained by the system through a process of self-regulation. Therefore, the system must contain some mechanism, however rudimentary, for the transmission and interpretation of information. This is accomplished through an information loop or feedback circuit, which involves a "sensory organ" and a "brain." The brain is "told" what is supposed to happen; e.g., the thermostat is set. The sensory organ perceives what is happening and reports this to the brain, which is able to distinguish the variance between the present position and the standard, or desired, position. It then must be able to initiate (or transmit) action in order to maintain the predetermined position.

(4) The gen system, or the level of self-maintaining structures. This is the level of the cell. At this level "life" is differentiated from "non-life." In addition to self-regulation, systems of this type are also capable of self-maintenance under input-output conditions and of self-reproduction.

(5) The genetic-social system, or the level of plants. Here division of labor among cells is done in a "coarse" and differentiated

parts is observed. Systems at this level also possess very primitive sensory organs which are able to perceive very basic phenomenal changes; e.g., light and darkness.

(6) Animal systems. These systems are distinguished by several characteristics: increased ability; evidence of goal-directed, or teleological, behavior; self-environment; specialized information receptors; and nervous system.

(7) Human system, or the consideration of the individual human being as a system. Man can be considered as a static structure, for it is possible to determine his anatomy. He can also be viewed as a single dynamic system—many of his functions are performed in terms of prelearned, memory actions. Having up the "scale of systems," one also exhibits cybernetic systems, self-maintaining structures and genetic-social systems. The characteristics of actual systems are also present in the human system. However, the human system possesses three unique characteristics: self-consciousness, symbolic interpretation and free communication. At this level a paradox is encountered: although self understanding does not exist about any operations of the human system, man is able to utilize the system. For example, the mental process through which this study has been written is largely unknown, yet it is known that the study has been written and that it will at least partially convey the ideas of its author. In the contrary, one can only utilize those systems of a lower level which he understands. For example, one can gain an understanding of the weather (a single, dynamic system) but one fails to predict its changes.

Eventually man's knowledge about the weather may reach the point where he is able to control it.

(C) Social systems, or the level of human organization. At this level the purposeful association of man is viewed as a system. Other than social organizations are included, for it is possible to view any form of human organization as a social system; e.g., a business firm, a monastery. This level is probably the one which man benefits most from the concepts of General System Theory. Through utilization of models constructed for comprehending phenomena which also occur in lower systems, it is possible that a more comprehensive analysis of social systems can be constructed.

(D) Transcendental systems, or the level of absolute. To complete his scheme Boulding suggests this highest level of system analysis. "There are . . . ultimate and absolute and the transcendable ultimates, and they also exhibit systematic structure and relationship."¹³

It could be argued that the above scheme is "just flim," but it represents nothing new; everyone has heard of these systems. Boulding has just arranged them in a hierarchy. To argue in that fashion, however, is to overlook the underlying significance of this "system of systems."

Perhaps one of the most valuable uses of the above scheme is to prevent us from accepting as final a level of theoretical analysis which is below the level of the empirical world which

¹³ Ibid., p. 281.

as one investigating. However, in a sense, each level theory-overwrites all those below it, such valuable information and insights can be obtained by applying low-level systems to high-level subject matter.⁵⁴

It can be concluded that there are no precise, or even readily discernible, limits to the scope of General System Theory. Seeking as it does to establish a science with applicability to all empirical realms, it must encompass all such realms. However, as Boulding has suggested, it does not seek to be a "general theory of practically everything." The apparent conflict between this statement and the preceding discussion of the scope of General System Theory deserves reconciliation. That discussion may be viewed as a "master plan" for General System Theory. It serves to establish a framework for researchers interested in horizons broader than those offered by a single discipline. As the products of general systems research are disseminated, the plan will approach fulfillment.

System Level of This Study

This study may be viewed as an attempt to help complete one small experiment in the master plan of General System Theory. Earlier a fundamental assumption has been offered: "the function of studying to explain wherever one encounters people organized to attain some objective." This occurs at the level of social systems; that level will be the base of the analysis presented here. The approach envisioned will be that of the General System Theorist, seeking to explain the

⁵⁴ibid., p. 383.

activity of analyzing as a characteristic aspect of all systems of this kind.

In the process of constructing a model for this analysis, it will be advantageous to utilize the contributions of others to General System Theory. In a symposium on General System Theory, Carl G. Hempel said: "It is well possible that the general mode of approach advocated by von Bertalanffy will prove a highly useful heuristic guide in the search for the solution of specific theoretical problems."¹¹ In the two approaches to General System Theory are complementary, results of the phenomena approach (e.g., communication within systems, growth of systems) will be of value in supplementing the existing analyses of social systems (which represent products of the system of systems approach).

In utilizing the general systems approach it is hoped that the deficiencies of the "traditional approach" to the analysis of intersocial functions may be overcome and that a truly comprehensive framework for that analysis may be evolved.

Integration of the Social Sciences

The level of social systems is the traditional domain of the social sciences. To the extent that an effective integration or synthesis of the social sciences is accomplished, this portion of General System Theory will achieve fulfillment. Therefore, it is appropriate that consideration be given here to the current status of efforts to bring about an integration of the social sciences. This will be under-

¹¹"General System Theory and the Unity of Science," Open Society, Vol. 12, No. 4 (December, 1961), p. 314.

taken in four phases: (3) what are the social sciences; (4) what factors are retarding integration; (5) what benefits are likely to accrue from integration; and (6) what evidence of integration are presently discernible.

What Are the Social Sciences?

Such debate exists over this question, many fundamental philosophical issues are involved. In a brief treatment such as this one it is neither possible nor desirable to consider these issues. Knowledge of them will be left to the philosophers of science. This discussion will, therefore, proceed in general—but hopefully meaningful—terms.

The social sciences, considered collectively, are those sciences which deal "with human society or its characteristic elements . . . and with the relations and institutions involved in man's existence and well-being as a member of an organized community."¹⁴ Individually, each of the social sciences considers a particular aspect of man's empirical world insofar as it involves his relations to others.

The Encyclopedia of the Social Sciences includes contributions from the following fields: anthropology, economics, history, political science, psychology, sociology, law, statistics, education, philosophy and social work. Various objections may be raised to the inclusion of certain items; e.g., law is not a social science because it is a

¹⁴Encyclopedia of the Social Sciences, 1949 ed., p. 608.

negative science, rather than a positive science.¹⁷ Additionally, certain other disciplines would claim the right to education, e.g., management, marketing.

In an effort to by-pass the disciplinary efforts of these debates, many social scientists now choose to refer to the "behavioral sciences."¹⁸ Here agreement is more readily obtained. The primary behavioral sciences are considered to be sociology, psychology and anthropology (especially social or cultural anthropology). The secondary behavioral sciences are economics, history and political science.¹⁹

In any event, whether referred to as social sciences or behavioral sciences, whether complete agreement is reached on which disciplines are social sciences or not, it is possible to proceed with an examination of those forces which are responsible for the current schism between the several disciplines.

¹⁷John V. Patterson, *Antisocialism: How and Why of the Law*, Brooklyn, New York, The Foundation Press, Inc., 1955, ch. 1.

¹⁸For a discussion of the origin of this term, see: James G. Miller, "Toward a General Theory for the Behavioral Sciences," *The State of the Social Sciences*, ed. Leonard S. White, Chicago, University of Chicago Press, 1955, pp. 75-85.

¹⁹This division is discussed in Talcott Parsons and Edward A. Shils (eds.), *Toward a General Theory of Action*, Cambridge, Massachusetts, Harvard University Press, 1954, pp. 26-28. It is also adopted in the recent Ford Foundation reports: Robert A. Gordon and James G. Smith, *Higher Education for Scientists*, New York, Columbia University Press, 1955, pp. 115-16.

Factors Deterring Integration

The history of each discipline tends to strengthen its desire for individuality. The members of each discipline have, at one time or another, found it necessary to convince their associates of the intellectual worthiness of their particular field. Once such recognition has been gained, it then seems incumbent to strive to increase the independence and individuality of the discipline. The province of the domain is fenced off, membership symbols are developed and "foreigners" are excluded through various devices.

Each of the social sciences has developed a more or less unique methodology. These peculiar techniques of research make the individual fields all the more impervious to the "uninitiated."

Although scientists like, I think, to predicate, at least in principle, an as yet undemonstrated unity of science, the reading of scientific literature and discussion among scientists of all kinds would suggest variations as great in the actual research procedures in different fields that these different fields would have to be considered as separate, if not distinct, of science.

Closely related to the above is the recognized fact that research requires specialization. As more and more emphasis is placed on research increasing specialization seems an inescapable result.

Research, of necessity, requires specialization, often in a very narrow field. It is probably also true that those exacting standards which fruitful scientific work demands can be acquired only through the complete mastery of at least one field, which today means that it must be a narrow field and, also, that it ought to be one which has its own firmly established standards. Thus a

²²Quotations from J. Bernard, "Social Sciences: Illusion and Reality," *American Anthropologist*, Vol. 55, No. 1 (January, 1953), p. 105.

progressive tendency towards specialization seems to be inscissible, bound to continue and to grow, both in research and in university education.¹¹

As each discipline grows to maturity the researchers utilizing the discipline's unique methodology must have a medium of communication. Specialized journals are developed and contributors to these journals pride themselves on their command of the particular discipline's jargon.

The reason for this break-up in the body of knowledge is that in the course of specialization the receptors of information themselves become specialized. Hence, physicists only talk to physicists, economists to economists—unless still, nuclear physicists only talk to nuclear physicists and econometricians to econometricians. One wonders sometimes if science will not prior to a step in an assembly of well-set-forwards, each speaking to himself words in a private language that only he can understand. . . . The spread of specialized discourses means that someone who ought to have something that someone else knows can't able to find it out for lack of generalized care.¹²

The "lack of generalized care" reinforces the separation of the social sciences. If one social scientist is unable to understand another, the interchange of mutually beneficial knowledge is impossible and each will go his own way ignorant of developments which could increase the total understanding of a particular phenomenon.

Another factor which is retarding the integration of the social sciences is the absence of responsibility for that task. If everyone is a specialist, who will venture forth as a generalist? If each

11J. A. Fuchs, "The Illusion of Specialization," *The State of the Social Sciences*, ed. Leonard P. White, Chicago, University of Chicago Press, 1954, p. 413.

¹²ibid., p. 194-95.

specialist limits himself to his speciality, she will be available to build the general theoretical framework essential to synthesis. "Indeed it is altogether plausible that the existing division of labor within the social sciences as a whole is working strongly against the development of the kind of theory that is most needed."²²

Other factors are also retarding an effective integration of the social sciences. Without exhausting the subject which judging from the existing literature is indeed inexhaustible, these factors discussed there may be considered suggestive. The two remaining phases of this discussion may be profitably consolidated; the benefits which are likely to accrue from integration are highlighted by these steps towards integration which have already taken place.

Interdisciplinary Cooperation

Kennedy has identified five "modes of potentially fruitful interdisciplinary cooperation."²³ Each represents a step towards synthesis of the social sciences.

(1) The empirical data assembled in one field can be illustrated by concepts developed in another field. For example, many of the basic assumptions of economic theory are psychological in nature. Encourager-

²²Robert A. Dahl, "Business and Politics: A Critical Appraisal of Political Science," Social Science Research on Business: Past and Potential, New York, Columbia University Press, 1959, p. 17.

²³The discussion which follows is based on the excellent presentation of Simon Kennedy, Some Frontiers of the Social Sciences, Glencoe, Illinois, Free Press (Inc.), 1955, pp. 15-21.

ing psychological variables, the economist invites them to be fixed so that they will not "clutter up" his economic analysis. Thus, when the economist gathers empirical data he may find his theoretical equipment lacking. He wants to apply psychological analysis to truly complete his task. The effective combination of economic and psychological analysis may yield a more comprehensive and realistic interpretation of the data.

(ii) Concepts and hypotheses developed in one field can serve to foster research in another. The example given above is also applicable here. Some psychologists could well devote their efforts to testing the psychological assumptions of economists, through empirical investigations.

(iii) The theoretical frameworks of two (or more) disciplines are brought to bear on the same empirical problem.

The cross-fertilization so ardently desired in recent years seems to be relatively little effective when it is imposed from an external view of unification. The psychologist and sociologist may be urged to lie down together like the lion and the lamb, but this kind of union has not been especially fruitful. . . . The joint approach to common problems independently set from outside the fields seems likely to be the most fruitful ground for research and theory in the social sciences.¹²

This joint approach is a first step towards integration. Success at this level leads to the establishment of "hybrid" disciplines; e.g., social psychology, economic sociology. In some cases an even larger

¹²James Miller, "Psychology and the Study of Business: Joint Interdisciplinary Sciences," *Social Science Research on Business: Product and Personnel*, New York, Columbia University Press, 1969, p. 49.

number of fields have been combined. Cybernetics is based on electrical engineering, neurophysiology, physics, biology and economics. Action organization theory is an attempt to unite economics, sociology, psychology, political science and cybernetics. In other cases joint research has led to the formation of interdisciplinary institutes; e.g., the Survey Research Center and the Group Dynamics Center, both at the University of Michigan.

(4) Another form of interdisciplinary convergence is what Lantieri²⁴ has called "adjacent dilutionism."

Certain procedures are used by a variety of social sciences. But in one discipline they are used competently and in another in a dilutive way. . . . Sociologists and social psychologists, for instance, have developed detailed skills in the writing of questionnaires. Economists, when they use questionnaires, often do so with . . . dilution. Economists have discussed the 10 years, with great care, the logic of index formation. Sociologists often slip together any index which happens to come to their mind.²⁵

This points up the need for interdisciplinary cooperation, in general, and interdisciplinary communication, in particular. The barriers to integration discussed previously are responsible for the uncoordinated use of techniques in one field and their sophisticated use in another.

(5) Another form of convergence is when one discipline adopts an entirely new method which was originally developed in another field. When attempted it is usually designed to facilitate empirical investigation; e.g., the March and Simon approach to organization theory. Although "adoption" is a rather infrequent occurrence, it does have

²⁴Paul F. Lantieri, unpublished paper, quoted in *Controversy*, p. 11.

significant potential for theoretical progress.

The value of a new method may extend beyond the function of testing or refuting the familiar generalizations already current in the discipline which has "borrowed" it. A new method brings new data and that in turn leads to the resolution of new problems and to the formulation of new problems.

Probably the best example of this is the adoption of public opinion survey techniques by the political scientists.

In the extent which the social sciences do converge and interdisciplinary communication improves, the likelihood of an integration of the social sciences is enhanced. It would be foolhardy, however, to anticipate a complete synthesis and the subsequent disappearance of the several disciplines. Efforts towards synthesis will undoubtedly lead to progress in the theoretical and empirical status of the separate social sciences, for the process of integration will eliminate those areas which are most in need of further investigation.

General System Theory and the Analysis of Managerial Functions

The significance of a general systems approach to the analysis of managerial functions may be established through the consideration of the questions.

1. Is the application of general system theory a purely academic development or is there some impetus from business?
2. Is there any indication that the development

¹⁷Lawrence, p. 34. (Emphasis his.)

of such an approach will help businessmen in solving their problems?

One of the strongest forces encouraging an integration of the social sciences, which will encourage the development of a General System Theory, is the desire of businessmen for a comprehensive theory of business behavior.²⁴ The present division of knowledge hinders the businessman in attempting to find solutions for the problems which he encounters. He is confronted by a vast amount of knowledge and data assembled in a variety of ways, incorporating unfamiliar terminologies and reported in a large number of journals.

There are some proponents of a science of business administration. However, the activity of managing is not exclusive to business enterprises. Public administrators have also expressed their wish for a more unified body of knowledge. The utilization of a general systems approach to the analysis of managerial functions, resulting in a general analysis of the activity of managing, could aid all managers.

The formulation of a general systems approach is not, however, likely to overcome the language problem. Academics can attempt to formulate useful theory, but to discipline provide, formal terminology is to reduce language then.

I am not particularly impressed with arguments that social scientists do not publish their findings in language intelligible to the layman, neither do physicians . . . The time is not far off when the competent manager—like any other professional

²⁴Ideas, for example: Peter F. Drucker, "Business Organization and Survival: Frontiers, Ranges and a Discipline of Business Enterprise," *Journal of Business*, Vol. 35, No. 2 (April, 1962), pp. 31-49.

practitioner-will find it a necessity to be well enough versed in the scientific disciplines relevant to this work to be able to read the literature and judge the adequacy of scientific facts and claims.²²

Thus, to the degree that businessmen require a familiarity with the requisite terminology and concepts, it seems realistic to anticipate beneficial results from the use of a general systems approach.

Established Disciplines and the Analysis of Managerial Functions

The relationship of the social sciences to General System Theory has been treated previously. Also, the need for an integration of the social sciences to form the level of social systems in the framework of General System Theory has been discussed. The purpose of this section is to suggest the relationships of established disciplines to the analysis of managerial functions, thereby demonstrating the history of General System Theory, the integration of the social sciences and the analysis of managerial functions.

Sociology

The analysis of the interaction among individuals in a social system is the domain of sociology. The process of managing takes place within a social system. To formulate a comprehensive analysis of managerial functions it will be necessary to rely on concepts developed by sociologists to explain collective action within groups and the establishment of group norms of conduct. In their study of social processes

²² Douglas McGregor, The Human Side of Enterprise, New York, McGraw-Hill Book Co., Inc., 1960, p. 4.

and social structure, sociologists have attempted to develop a general model. These developments will aid in providing a general analysis of managerial functions not limited to business enterprises.

Psychology

In managing business getting things done through the efforts of other people, the contributions of psychology are pertinent to this study. The action of individuals within the environment of a system is the primary interest of psychology.³² The analysis of managerial functions requires a treatment of human motivation and behavior. Reference must be placed upon psychology for a systematic treatment of the existing knowledge in this area.

Economics

The analysis of the production, distribution and consumption of wealth is the object of economics. The theoretical structure which has been developed in economics is the most comprehensive of any dealing with man's material world. The analysis of managerial functions can benefit greatly by the contributions of economics. All social systems have their economic aspects, for in every social system some allocation of resources must be accomplished. The purpose of managing is to bring about the orderly attainment of some objective. Thus, to

³²Undoubtedly some readers will disagree with this definition of psychology. It is impossible to frame a definition of any discipline which will be acceptable to all. The primary purpose here is to indicate the way in which the various disciplines can aid in the analysis of managerial functions.

With this aim, it will be useful to have open discussion for concepts which aid in comprehending the allocation of resources to achieve predetermined ends at minimum cost.

Political Science

Political science usually refers to the study of those institutions responsible for government established within societies. It is taken to include government organization, politics, political parties, international relations and so on. However, the most relevant phase of political science to this study is that which studies the power structure within social systems. The analysis of managerial functions must include an account of the nature and functions of the power structure within the social system. The relationship of the manager to other individuals in the system and the interrelationships among individuals form the basis of the power structure.

Management

The most extensive analysis of managerial functions presently existing is that which has come about through the "traditional approach."²¹ Although contributions to the analysis have been made by others, the majority of current knowledge in this area is labelled "management."²² Thus, the literature on formal organization theory will form part of the foundation for this study. The success of this study may be measured in terms of the extent to which it provides a framework for a more compre-

²¹For a discussion of the "traditional approach" and the definition of management; see above, Chapter I, pp. 1, 10.

itative analysis of managerial functions and overcomes the limitations of the traditional approach.

A "sub-discipline" of management which has developed in recent years is "modern organization theory."

The distinctive qualities of modern organization theory are its conceptual-analytical base, its reliance on empirical research data and, above all, its interpreting nature. These qualities are framed in a philosophy which accepts the premise that the only meaningful way to study organization is to study it as a system.²¹

Modern organization theory has not, as yet, attacked the analysis of managerial functions. It has begun the task of shifting the analysis of organization from the limited base of business enterprises to the more generalized base of a system. In the process the modern organization theorists have attempted to incorporate concepts from the other social sciences, in such the case way that they will contribute to the present analysis of managerial functions.²²

²¹William G. Scott, "Organization Theory: An Overview and an Appraisal," *Journal of the Academy of Management*, Vol. 4, No. 1 (April, 1961), p. 16.

²²Kurt Lewin, one of the leading proponents of modern organization theory, has described the relationships as follows: "In many ways, the interest in organization theory is a particularly apt example of the interdisciplinary theme of many of the social sciences. It borrows part of the economist's traditional theory of the firm. For the student of business, there are the customary problems of control and administration. The sociologist turns to norms, roles, and the informal structure. . . . Political scientists take account other groups in the interest in power and authority in hierarchical structures, and in the institutional theme of governing structures. Social psychologists apply their concepts about group structure and communication nets. . . . It seems certain that this area will be one of the richest in generating both concepts and research in the future." Lewin, pp. 71-72.

The above discussion by no means exhausts the relationships between established disciplines and the analysis of nonspatial functions. And, if the relationships between sub-disciplines were to be added, much more could be written.

Formulation of the foundations for a general systems approach to the analysis of nonspatial functions is begun in the next chapter. There, and in subsequent chapters, the attempt will be made to employ the methodology of General System Theory to construct an analysis of nonspatial functions applicable to all known representations. The analysis will incorporate concepts developed in the specialized disciplines which are germane to the approach to be developed.

CHAPTER III

ORIGIN, GROWTH AND FUTURE OF INTEGRATED BEHAVIOR SYSTEMS

This study is an attempt to demonstrate the usefulness of a general systems approach to the analysis of nonspatial functions, explaining the activity of maning as a phenomenon common to all systems at the level of human organization. The two preceding chapters were designed to place this study in the proper perspective.

In Chapter I a brief history of the development of the "traditional approach" to the analysis of nonspatial functions was presented. This was followed by consideration of the inherent limitations of that approach. The traditionalists have not reached their goal of a comprehensive analysis because of their approach, which calls for massive superstructure upon an unshakable foundation.

Chapter II was devoted to General System Theory—its purposes, origins and scope. The relationship of General System Theory to management and the relationships of both to the social sciences have been set forth to indicate how General System Theory and the integration of the social sciences can aid in the formulation of a comprehensive analysis of nonspatial functions.

The starting point for developing that analysis is the concept of an organized behavior system. In this chapter the origin, growth and

survival of organized behavior systems will be analyzed. Before proceeding, however, the way in which certain concepts fundamental to the analysis are to be used and how they are related to one another should be established.

Concept of an Organized Behavior System

A "system"—any system—is any complex of interacting elements; or an assemblage of objects or individuals, united by some form of regular interaction and/or interdependence. In specifying a particular system it is essential to identify (1) the objects or elements of the system, (2) the boundary of the system, and (3) the form of interaction or the relationships which unite the system as a whole.

An "organized behavior system" is a group taken in conjunction with the environment in which it operates and has its being, including the instruments and resources utilized in its operations. A "group" is defined as two or more individuals linked together by positive expectations concerning the outcome of their association.

The objects of the organized behavior system are individuals, who have organized to attain some objective. "Organized" requires (a) that these individuals have consciously joined together; (b) that they recognize a more or less stable set of relationships which specify the duties, powers, position and so on of each individual; and (c) that they acknowledge certain individuals as having the right to define group objectives or goals and the way in which these objectives should be attained.

The boundary of the organized behavior system distinguishes the system from the environment of the system. Included within the concept of an organized behavior system are those individuals contributing to the system and the instruments and resources utilized by the group, as a group. All that is excluded from the system constitutes the environment. Specifically the environment is the set of all objects + change in which affects the system and also those objects which are affected by a change in the behavior of the system.

If the system includes those objects which interact with one another and the environment includes those objects which interact with the system, it is sometimes difficult to establish with precision whether a given object is part of the system or part of the environment. In this study the system includes those individuals who interact on a relatively regular, stable basis and who are under the control of the system; it excludes those who interact on a relatively irregular, intermittent basis and who are beyond the control of the system.¹

¹For example, the question arises when viewing a particular business as a system whether the firm's customers are part of the system or part of the environment. The position taken here is that the customers are part of the environment. Although they interact with the objects of the system, this interaction is likely to be on a relatively irregular basis. Furthermore, the action of the customers is beyond the control of the business. However, a change in customer behavior will affect the system and a change in the behavior of the system will affect the behavior of the customers. (Clement Bernard differs from this view; see his *The Functions of the Executive*, Cambridge, Massachusetts, Harvard University Press, 1939.)

To take another example considering a particular business as a system, government regulation could be considered as an element of the environment. A change in the nature and extent of government regulation will affect the system, but the degree of regulation is beyond the

Many forms of interaction take place within an organized behavior system. Interaction results in the formation of relationships among the components of the system; these relationships tie the system together. Later in this study attention will be directed to three primary kinds of relationships which exist within an organized behavior system. The analysis of these relationships will utilize the concept of a subsystem.

Systems may be divided into subsystems in much the same way that the "universe" is divided into system and environment. A subsystem is a subdivision of the system. The environment of a subsystem includes the original system. The behavior of the subsystem is not necessarily completely analogous with that of the original system. The concept of subsystems facilitates the task of specifying the relationships among the elements of the system. Thus, communication relationships will be analyzed in terms of the "communication subsystem," power relationships in terms of the "power subsystem" and sporting relationships in terms of the "sporting subsystem." These three subsystems are three ways of viewing the interaction within an

control of the business. A change in the behavior of the business, however, may result in a change in the impact of government regulation.

The crucial test for establishing whether an object is part of the system or part of the environment is the degree to which the object is controlled and guided by the system. If the object's action is for the most part independent of the system, it is taken to be part of the environment.

organized behavior system.² All of them exist simultaneously within the system; isolating them into distinct subsystems is a tool of analysis.

To summarize, in this study an organized behavior system is a group of individuals organized to attain some objective. These individuals, along with the instruments and resources utilized by the group, as a group, form a system of action within an environment which both affects and is affected by the system. The interaction which takes place within the system will be analyzed primarily in terms of the communication subsystem, the power subsystem and the operating subsystem.

The organized behavior system is construed as a totality which is adaptive to influences upon it from internal and external sources. The system has properties and functions distinct from those of its constituent elements. Thus the system endorses a "life" and its own separate goals.

Origin of Systems

Individual Goals and Cooperation

The basic theme of the above definition of an organized behavior system is that it is a group of individuals who have associated to accomplish some objective. In this section the nature of individual

²It would also be possible to view one department of a large organization as a subsystem, examining relationships within that department and then relating the operation of that department (subsystem) to the larger organization (system).

goals and the characteristics of competition among individuals will be treated. The next section will be concerned with the association of individuals and the development of systemic goals.

Individual goals arise from activity to satisfy a complex of needs.³ A "goal" is the objective for which purposeful activity was initiated and sustained or, quite simply, something for which the individual strives. Thus, to comprehend goals, it is necessary to first understand man's needs. "Many lists of needs have been worked out, ranging in length from explanations of all behavior in terms of two or three basic needs to very long lists that seem to account for each specific act by a new need. It is probably impossible to say at this time what is the correct list of needs, or how many there actually are."⁴

It is likely that man's goals result from more than a few basic needs and it is unlikely that every act reflects a unique need. Rather than either extreme, the more plausible explanation is that goals represent a composite of needs. It is not an oversimplification to consider man's needs in three broad categories: physical, social and

³The term "need" is used here in a broad sense and is taken to include: (1) needs (in condition of unmet need); (2) motives (more or less well developed drives to behavior, not in characteristic activity); and (3) drives (any impetus, psychological or physiological, to behavior). Utilizing the fine distinctions between these terms would not advance this analysis. See Felix Garrison, See Dictionary of Psychology, New York, Philosophical Library, 1947; and Felix Garrison, A Handbook to Psychological Terms, Paterson, New Jersey, Littlefield, Adams Co., 1947.

⁴Samuel Butler, Psychology in History, New York, Modern-Hill Book Co., Inc., 1918, p. 17.

epistemic. The way in which an individual acts about satisfying these needs results in goal-directed, or teleological, behavior.

Physical needs are for the most part physiological in origin. Included are those things which are required as a medium for existence: food, water, shelter, sleep, cleanliness, etc. Human activity is directed towards satisfying these primitive needs first.

The second category of needs, social needs, are those which find satisfaction in the establishment of a certain relationship with other people. The desires for affiliation with others, for affection and the numerous are typical of needs grouped into this category.

Epistemic needs are those needs which are oriented towards securing a particular view of one's self or one's world. e.g., the need for acquisition, the need for autonomy, the need for dominance. They are satisfied by status symbols, by recognition, by being a member of the "right" group, by having authority over others and so on. Although relationships with others is often a means to satisfying epistemic needs, it is not the end product, as it is in the case of social needs.

From the nature of man's needs, it is possible to form certain generalizations. First, man's needs are never completely satisfied. "All of life is a struggle to satisfy the many needs that everyone has, and it is a never-ending struggle, because the human being is built in such a way that as soon as he partially satisfies one or two needs several others are pressing on him and demanding attention."⁸

⁸Ibid., p. 23.

It is therefore very difficult to establish with certainty why a particular individual pursues a particular course of behavior. Considerable risk is involved in attributing a course of behavior to one need or even to one category of needs. For example, it could be said that people work to earn money with which to purchase those things necessary to satisfy physical needs. But it is known that people also work to satisfy social and egoistic needs.

This situation leads to a second conclusion. The course of behavior pursued is a function of the multiple pressures of the several needs that are acting upon an individual at any one time. Through a complex of processes, which is still not completely understood, each individual establishes goals based on an evaluation of his needs and the ways of satisfying those needs open to him.

A third conclusion deducible from the nature of man's needs is the universal feature of competition among men. Due to the abundance of needs relative to resources (means of satisfying needs), men must compete with others. In seeking to satisfy his needs, through performance of a course of action leading to the attainment of his pre-formulated goals, man comes into contact with others who are seeking the same things. Man's success in competition determines his survival.⁴ However competition for survival is only one of the basic kinds of interaction among men; it is not the exclusive kind. The concept of competi-

⁴Competition in used here in the broad sense of any rivalry between two or more parties. The distinctions made in economic analysis are not germane to this discussion.

ation will be used to enhance the second basic kind of interaction.

Association and Epistemic Goals

The discussion of needs has indicated two of the reasons why men associate with one another. First, association serves as the end product in satisfying social needs, which require the formation of certain desired relationships with other people. Second, association often serves as a means for satisfying epistemic needs.⁷ Recognition, esteem and the like are awarded by others and therefore close association and interaction with others is a prerequisite to meeting these needs.

A third, and probably the most important, reason for association is man's recognition of the superior effectiveness of group effort. An individual joins with others to obtain some surplus of satisfactions or expectations as compared with isolated (individual) action. Each individual expects to have certain expectations concerning his participation in group activities and the other members, in turn, have certain expectations concerning his behavior.

Men attempt to establish some order in his activities and relationships. In most cases this cannot be done unless he joins with others and they pool their abilities and energies. As Kelley and Argyle have noted "The secret they do is the first necessary step towards the creation of

⁷As epistemic needs are concerned with acquiring a particular view of one's self, it is possible to satisfy some of them without association. For example, an individual's desire to be a parent can be satisfied without contact with others; it can come about from his own feelings towards his ability to distinguish fine foods. Recognition of this ability by others will, however, tend to increase his satisfaction.

an organization is present.²

When a group becomes formalized or organized, it may then be referred to as an organized behavior system. At this point in systems evolution it is also possible to distinguish members of the system as belonging to either of two classes: managers or subordinates. As a preliminary definition, a "manager" is any member of an organized behavior system who is recognized by other members of the system as having the authority to prescribe group goals and the methods for attaining these goals and who is responsible for the accomplishment of these group goals.³

The purpose of any organized behavior system is the attainment of resources to achieve expectations. What these expectations are in specific cases is a function of the individuals and circumstances involved in a specific system at a specific point in time. This makes it impossible to generalize about the specific goals of specific systems. However it is possible to generalize about what will be called systemic goals or those goals which are common to all systems. It is clear that regardless of the specific individuals, circumstances or time involved, a system operates as if it had goals of its own.

²J. Edgar Sabbe and Chris Argyris, *Organization Structures and Principles: A Systems Approach*. See Argyris, *Consciousness*, Yale University Labor and Management Center, 1954, p. 1.

³Managers include executives, leaders, administrators, superiors, etc., insofar as they meet the requirements of the definition adopted here. Subordinates include "non-executives," followers, henchmen, etc., and may include managers who are subordinates of a superior manager.

The systemic goals of organized behavior systems are (1) to produce satisfactions for members of the system; (2) to provide stability and continuity of relationships within the system; (3) to grow; and (4) to survive.

As has been demonstrated above, organized behavior systems come into being as a result of the expectations which individuals hold about the superiority of group effort. Individuals associate because they feel that such associations will aid them in effectively attaining their individual goals and consequently in satisfying their needs. Unless their expectations are met, the survival of the system is endangered.

The survival of the system is also affected by the stability and continuity of relationships which exist within the system. Associations arise out of man's attempt to bring order into his activities and relationships. A chaotic state within the system negates this motivation to associate and may destroy the system.

Thus, the basic systemic goals become growth and survival. Each of these permeates the entire activity of the system. The organized behavior system seeks to make an agent of the individual for the achievement of its goals and, simultaneously, the individual seeks to make an agent of the system for the achievement of his personal goals. In the process both the system and the individual are modified.¹⁰

¹⁰This phenomenon is at the basis of a scheme developed by E. Micht Schike, which he has termed the "fusion process" and about which he has written extensively. For example, see his *The Fusion Process*. New Haven, Connecticut, Yale University Labor and Management Center, 1964.

Furthermore, the two basic systemic goals of growth and survival are also applicable to subsystems. This results from the fact that every subsystem may be viewed as a system. Every properly defined subsystem will continue actively directed toward growth and survival of the subsystem within the system.¹¹

In summary, the origin of organized behavior systems is to be found in the nature of individual needs and goals, and in man's recognition of the superior effectiveness of group effort. In attempting to bring order to his activities and relationships, man associates with others and in so doing takes the first step towards the formation of an organized behavior system. Upon formation of the system it becomes possible to discuss the elements of membership (members and subordinates) and the basic systemic goals of growth and survival.

Growth of Systems

This part of the chapter seeks to answer three questions:

1. What is the motivation for systematic growth? i.e., why does growth appear as a basic systemic goal?
2. What are the fundamental principles of systematic growth?
3. What stages of growth may be identified?

¹¹Although it is beyond the scope of this study, others may wish to pursue the hypothesis that this statement is the basis for the growth of government systems. It has been advanced by L. Northcote Parkinson in his Paradoxes of Man (Boston, Houghton Mifflin Co., 1967).

Definition for Growth

Growth refers to changes in the organized behavior system's capacity for action. Although growth is normally taken to mean an increase, changes in capacity may be either positive or negative. Thus a decline may be treated as negative growth. It should be understood that while the following analysis emphasizes positive growth, it is also applicable mutatis mutandis to negative growth.

Growth involves the maintenance and advancement of the system's capacity for action. An organized behavior system grows to increase its ability to provide satisfactions for its members as a greater whole. This growth may result from either expanding the volume of present activities or engaging in new activities.

Growth, as a systemic goal, is a reflection of the goals of the individuals composing the system. It will be recalled that the nature of man's needs is such that he never satisfies all of them. As his current expectations are fulfilled, he raises his level of expectation. At the new level he wants more and more or, at least, better and better. For the system to satisfy the increasing expectations of its members, it must grow and increase its capacity for action.¹²

To analyze systemic growth the form of growth must be established. Three choices are available: (1) static growth, (2) population growth,

¹²Growth, in the present context, does not necessarily mean getting "bigger." A system may grow by becoming more efficient. An efficiency is a ratio of useful output to input; greater efficiency can mean either: (a) less input for a given level of output; or (b) more output for a given level of input. Both represent growth.

and (3) structural growth. A single growth function would involve measuring the growth of an organized behavior system in terms of one variable over a period of time. As growth has been defined as a change in the capacity of the system for action, it would be reasonable to consider this as the single variable. However, measurement requires a common unit of measure and no comprehensive unit exists for organized behavior systems. Therefore, at least temporarily, the single growth form must be rejected.

The second form, population growth, encounters difficulties of application also. Measuring growth in terms of the age and distribution of the member population would be superficial and artificial. An organized behavior system includes, in addition to its constituent members, the instruments and resources utilized by the group. The system may change its capacity for action by varying the proportion of members to other resources, rather than only through changes in the number of members. It is also possible for the capacity of the system to change without a change in the number or proportion of members as a result of qualitative changes in the members (i.e., collectively, changes in the capacity of individual members will affect the system's capacity for action).

Structural growth does provide a meaningful form for measuring changes in organized behavior systems. A system is a complex of inter-related parts and the growth of the whole requires changes in the relation of the parts. When the system grows, the size and the parts change; new parts are added and old ones are dropped. Growth involves

not only over-all size, but also complexity within the system.

Principles of Growth

Certain fundamental principles of growth apply to all living systems.¹³ The present discussion seeks to utilize these principles in analyzing the structural changes which occur in organized behavior systems.

The first principle may be referred to as the principle of nucleation. Every organized behavior system has a nucleus size, which is the nucleus. The character of the nucleus has a pronounced effect upon the growth of the system. Once the nucleus has been established, additions may be related to it. In the present context, the nucleus of an organized behavior system is considered to be the establishment of a group and the recognition of one member of the group as a manager. Thus it is possible to consider any two-person group as the nucleus of an organized behavior system provided one of them functions as a manager.¹⁴ The manager is the critical portion of the nucleus.

¹³ Pursuant to the "phenomenon approach" discussed in Chapter II, above, efforts are being made to formulate a general theory of growth. This section draws upon such work. For example, see Kenneth L. Boulding, "Toward a General Theory of Growth," *Canadian Journal of Economics and Political Science*, Vol. 18, No. 3 (August, 1962), pp. 326-343.

¹⁴ The partnership form of business enterprise is amenable to this definition. If the two partners function as a recognized superior-subordinate basis, a nucleus exists without further members of the group. If the two partners function as co-managers, they jointly occupy one position in the nucleus (the manager) and a third individual will be needed to occupy the subordinate position. Analytically, however, this is a two-person group.

Although he must have at least one subordinate to be a manager, he may have more than one. Once a particular type of organized behavior system has been established and displays superior ability to grow and survive, it becomes a model for other systems.

The second principle of structural growth is the principle of non-proportional change. "In any structure grown, the proportions of its parts and of its significant variables grow remain constant."¹³ If an organized behavior system could be described in terms of length, area and volume, it would be readily observable that a uniform increase in the linear dimensions of the system would increase all areas in the square and volume in the cube of the increase in the linear dimensions.¹⁴ Because of this, the principle of non-proportional change is often referred to as the "square-cube law."

Although an organized behavior system does not have measurable dimensions, it is possible to ascertain the applicability of the square-cube law. Recognizing that it is a simplification, consider a fairly large organized behavior system started in the form of concentric circles. The innermost circle would represent those individuals immediately subordinate to the central manager (chief executive); the next, their subordinates; and so on, until all members of the system have been properly located on the various circles. It would now be

¹³Hocking, p. 391.

¹⁴Henry Thompson, *On Growth and Form*, 2nd ed., Reprinted, Cambridge, England, The University Press, 1952, p. 22.

possible to "measure" the distance of any member of the system from the control manager. Then, if growth occurs with more members being added to the system, two alternatives are available: (a) add additional circles (probably at the outside); or (b) add more members to existing circles.¹⁷ In either case, the proportions of the structure do not remain constant.

This leads to the formulation of two corollaries to the principle of non-proportional change. First, the growth of a structure always involves a compensatory change in the relative sizes of its various parts. Questionably, the organized behavior system may attempt to solve problems of growth or it may attempt to avoid the problems.

Assuming that the distance of a member from the control manager is a rough approximation of the distance that communication must travel, growth of the structure increases the time and distance required for communication. The system may attempt to solve the problems of communication by devoting a larger proportion of its members and resources to communicative activity.

Or, the system may attempt to avoid the communication problems attendant to growth by diminishing the need for communication. This could be accomplished by some combination of redistribution of activity and increased autonomy for dispersed units of the system.¹⁸

¹⁷This is the open vs. level situation common to literature of the "traditional approach." For example, see Ralph C. Davis, The Functions of the Executive, New York, Harper & Bros., 1948, pp. 141-147.

¹⁸Regarding a subunitary as an organized behavior system, for example, as growth occurs various subunits are granted greater and greater freedom of action in their sphere of operation. Operations controlled

A second corollary of the principle of non-proportional change is that the size of the structure itself is limited by its ultimate inability to compensate for non-proportional changes. Once again, communication problems present a vivid example. As growth occurs in the system, a larger and larger proportion of the system is devoted to overcoming and resolving the problems of communication between the outer circles and the central managerial core. A larger and larger number of individuals in the system are devoted to recording what is happening within the system, especially at the fringes. At some point the burden of communication begins to outweigh the advantages of large size. It then becomes necessary for the system to stop growing; further growth is disadvantageous. To preserve some coherence of the system and still facilitate growth, the system may divide into several highly autonomous systems.

A third principle of structural growth, which may be referred to as the principle of limitation, is that the present form of an object is a result of all of its past of growth up to that amount. The present form of an organized behavior system is dependent upon the previous growth which has taken place within the system. In examining organized behavior systems it is possible to detect units whose functions are isolated or whose size relative to the whole is not "correct" in terms

from a point close to the central manager (the president of the university) are restricted, so that department heads have prescribed ways of selecting supplies, hiring personnel, recommending practices, etc.

of contribution to present operations. Units are also found which are still grouped on the basis of the situation which existed at the time of their formation, rather than on the current situation.

The growth of organized behavior systems evidences operation of what will be called the principle of adjustment to variability. Elements of the system must be adjustable to the structure of the system or the structure must be adjustable to the elements. As an organized behavior system increases its capacity for action, some plan for structural growth must exist. During growth the members added to the system must adjust to the structure; i.e., the variability in the character of the members must be "willed" to fit the plan. Or, if this is not desirable or feasible, the planned structure must be adjusted for the variability in the members.¹⁵

The principles of growth permit speculation about the structure which is likely to develop as an organized behavior system pursues the systemic goal of growth. The "principle of reduction" coupled with the "principle of non-proportional change" indicates that as the system expands outward from the nucleus the relations of the parts amongst remain constant. Furthermore, the system will attempt to compensate for these changes by devoting a larger proportion of its members and resources

¹⁵In large, relatively authoritarian organized behavior systems, it is likely that the elements will be forced to adjust to the structure or be forced out; e.g., giant corporations, the military, nation. Less authoritarian systems are likely to adjust structure to the variability of new members. In other words, big systems fit the man to the job; small systems fit the job to the man.

success in solving problems which arise from growth, or adjusting the relations within the system in the attempt to avoid growth problems. The rigidity of structure will influence the way in which the "principle of adjustment to variability" will operate within the system. The "principle of assimilation" states that the present structural form can be best understood in terms of past growth. Finally, the size of the system is limited by its ultimate inability to compensate for non-proportional changes.

Certain additional facets of growth, especially the balancing of growth and stability, may be more properly considered in connection with the survival of systems. However, it will be advantageous to first examine those stages of growth which occur in organized behavior systems.

Stages of Growth

The "life" of an organized behavior system is analogous to the life of any organism. There is a period of gestation preceding "birth" and there is dissolution upon "death." During the life of the system it is possible to identify three more or less distinct stages of growth: establishment, expansion, and consolidation and stabilization. The system faces different problems of growth and survival in each of these stages.

The growth curve for organized behavior systems is similar to all organized growth curves. Changes in the number of members in the system or changes in the level of output might be considered as a rough

measure of growth, or changes in the system's capacity for action. Growth does not proceed at a constant and continuous rate; either the growth curve tends to be cyclic in shape.

Establishment.—An organized behavior system does not just "happen." The establishment of a system follows a period in which a potential nucleus is being formed. As several individuals associate, the prospect of action in concert is considered. If these individuals come to hold positive expectations about the performance of the association and recognize a number of the group as a manager, a system is "born." During the period of establishment, the system seeks to find its "niche" in the environment. In order to act at all, it must provide satisfactions which its members do not find available elsewhere. As additional members and resources are added to the system, about the nucleus, the system enters the stage of expansion.

Expansion.—This is a period of rapid, positive change in the system's capacity for action. It is quite probable that an equilibrium rate of growth must be maintained during expansion, such that any other rate of growth would seriously disrupt the functioning of the organized behavior system. Extreme rates of growth are related to the strength of the system. When growth rates are very high, the system is weak due to lack of compensatory changes in structure. When growth rates are very low, the survival of the system is jeopardized due to failure to meet the expectations of members of the system.¹⁰

¹⁰W. Stuart Dugale, "The System Size of Institutions: A Theory of the Large Group," *American Journal of Sociology*, Vol. 44, No. 1 (March, 1937), p. 481.

Although there must be structural changes to compensate for growth, success of the system may temporarily overcome growth problems. However, the organized behavior system must continue to compensate for growth; its ultimate inability to do so will force still further growth. As growth proceeds, the system eventually structures conditions, both internal and external, which are less and less favorable to growth. Such conditions usually signal the beginning of the third stage of growth.

Consolidation and stabilization.—Following periods of rapid growth, the system attempts to complete the adjustment to its new level of operation. Efforts are directed towards consolidating previous gains and maintaining the system's position within its environment. This phase is essential to survival and/or to additional, future growth. Furthermore, specialization of activity within the system requires a certain degree of stability of relationships and a guarantee of continuity of function.²¹

The stage of consolidation and stabilization may represent a position on the positive portion of the growth curve and be followed by additional growth; or it may be the peak of the growth curve, following which negative growth occurs. At some point the organized behavior system is no longer able to survive and dissolution occurs. The factors bearing on the system's ability to survive are discussed in the following section.

²¹Robert L. Thompson, Energy, Organization, & Control Theory, New York, Alfred A. Knopf, Inc., 1961, p. 14.

Survival of Systems

Expectations of Members

Importantly the single most important factor affecting survival is the ability of an organized behavior system to satisfy the expectations of its members. The origin of systems is found in those expectations which members of a group have about the benefits of organized action. The systemic goal of growth stems from the increasing expectations of members. To the extent that the system succeeds in fulfilling those expectations, it will survive.

Each member of the system has a certain status or relationship to other members of the system. Expectations are dependent upon status, because shares in the output of the system are correlated with status. An individual will remain a member of a given system as long as his status expectations are satisfied or until a better alternative appears. If no such alternative exists (or is known to him), it is likely that the member will adjust his expectations to correspond to his status. The individual will be willing to adjust his behavior to the required norms of the system (i.e., accept discipline) only as he anticipates benefits commensurate with his actions. If such benefits are not forthcoming, he will eventually withdraw from the system. Unless the system is able to compensate for departures through replacement or substitution, it will be unable to survive.²¹

²¹See also, *Exploring Behavior and Experience Systems: A Functionalist Approach to Sociological Theory*, Newcomb, Glendon, Richard E. Kelly, Inc., 1967, pp. 14-15.

The system's ability to satisfy the expectations of its members—and hence its survival—is dependent upon (1) effective strategy, (2) response to changing environment, (3) growth, and (4) stability and continuity.

Effective Strategy

Because of changing expectations risks must be undertaken in attempting to maintain and increase the system's capacity for action. Risks cannot be avoided through inaction, as the risks attached to inaction are greater, in most cases, than those associated with action. The way in which a combination of activities is to be undertaken by the system may be referred to as a "strategy."

The selection of strategies involves an examination of alternatives open to the system and an evaluation of the risks accompanying each. Choice in the current situation will normally be that one which is expected to provide the broadest choice of action in the future. Additionally, the strategy selected will be designed to strengthen the system where forces tending to destroy it are strongest.²⁴

It is essential that strategies be developed to repulse "attacks" upon the system from the environment and to spread into those portions of the environment occupied by other organized behavior systems. This occurs at the "fringe" of the system or that portion next adjacent to the environment. The system is sometimes able to survive attacks be-

²⁴Sam Hays, System Organization Theory, New York, John Wiley & Sons, Inc., 1959, p. 22.

ness of the strength of the "core" or that portion of the system which is relatively undesirable to attack.

In order to survive the system must be successful in the selection and execution of effective strategies, which are capable of repulsing attacks and maintaining the strength of the core. Penetrating the portion of the environment occupied by other systems is normally the key to growth.

Response to Changing Environment

An organized behavior system operates within a dynamic environment. Closely related to the system's ability to pursue effective strategies is its capacity for adjusting to a changing environment. To survive it must be able to reorganize its present activities and/or take on new functions in response to environmental changes. That organized behavior systems are capable of resisting failure during transitional periods is evidence of the strength of the survival goal.¹⁶ Large size and a high degree of specialization of function generally place the system in a more vulnerable position. Large, specialized systems usually lack flexibility, because of emphasis given to stability.¹⁷

¹⁶Alfredson, p. 18.

¹⁷A notable exception was the reorganization of the National Foundation (for Infantine Paralysis) in 1954, following the introduction of high vaccine. The directors of the Foundation were able to preserve the organization even though its original purpose had largely been accomplished.

Growing Through Growth

Although growth has been discussed previously as a basic systematic goal, certain additional influences of the growth process are directly relevant to the systematic goal of survival.

Without replacement, the life of an organized behavior system is limited to the life of its present members. Therefore, if not to increase capacity, but merely to maintain it, the system must attract new members. Its ability to do so is partly a function of anticipated growth. The expectations of present members are also influenced by anticipated growth, which may be sufficient to dissuade them from otherwise withdrawing from the organized behavior system. Finally, after a period of consolidation and stabilization, a system may be able to reverse its negative growth and survive through renewed, positive growth.

Stability and Functionality of Relationships

Survival of an organized behavior system is also dependent on the stability and continuity of relationships within the system. Such relationships establish the status of members, which determines their share of the output. If a member cannot safely anticipate his rewards, he is likely to search for other associations which will provide equal rewards with greater security. An individual joins a system to bring order to his activities. An unstable situation within the organized behavior system negates this benefit, and fails to meet the expectations of the member. It is therefore incumbent that the system balance growth

and responses to the changing environment with stability and continuity of relationships within the system.

Systemic Pathology

The discussion of systemic pathology provides a consistent and meaningful approach to understanding the growth and survival of organized behavior systems. Pathological conditions represent malfunctioning within the system and, as such, affect the growth and survival of systems. Seven pathological conditions have been selected for presentation here. It is likely that in a specific system no single one of these could be entirely responsible for failure of the system to function properly.

Increasing Expectations of Members

The ability of the system to satisfy the expectations of its members has been given a prominent place in the preceding analysis. It will be recalled that the increasing expectations of members are the motivation for growth. In effect, the increasing expectations of members force the system to seek ways of expanding its capacity for action. However, if the system is unable to absorb the consequences of growth rapidly enough, the expectations of members may become excessive. The growth process must be tempered by stability within the system. This situation leads to abandonment of the hypothesis that an equilibrium rate of growth exists. Excessive expectations may lead to a number of undesirable consequences, including internal conflict, interference with the evaluation of risks attending available alterna-

tion, under emphasis on immediate "payoff" of activities and collapse of the system.

Power as an Ideal

Every member of the system is related to all others through a series of relationships. These relationships form a network which specifies the ability of one member to influence the actions of others in the organized behavior system. When an individual attempts to increase his power solely to an over-expanding number of members, he disrupts the power structure of the system. Such an individual asserts all of his activities to promoting his own image. Such activity leads to excessive expectations on his part (because he over-estimates his importance to the success of the system) and on the part of those members who have submitted to his influence. Eventually, in selfishly promoting his power to influence, a member provokes conflict within the system.

Internal Conflict

Conflict within the system may arise from a variety of causes. The primary sources of conflict are: (1) an uncontrolled competition within the system, (2) an inability to agree on matters of mutual interest to several members, e.g., specific group goals, status, (3) a lack of adequately specified relationships within the system, and (4) a failure to adjust to variability in the character of incoming members. The principal impact of internal conflict is to cause a disproportionate amount of effort to be devoted to resolving the conflict, which temporarily reduces the effective capacity of the system. Internal conflict

frustrates attempts to achieve consistency and stability within the system which, in turn, threatens survival of the system.

Misallocation of Capacity of System

Reduced allocation of the capacity of the system will have serious repercussions. Misallocation of capacity delays growth, as it affects the evaluation of alternatives open to the organized behavior system. It also reduces estimates of the system's ability to adjust to changes in the environment. It distorts the entire process involved in the selection of strategies. Overallocation of the capacity of the system increases its vulnerability to attacks from the environment. It obscures the possibility of failure to meet the expectations of members.

Imbalance of Structure

Growth of an organized behavior system requires that compensatory changes be made in the relations of the parts of the system. If these changes are not made when and as needed, an imbalance of structure is likely to result. Or, if the changes over-compensate for growth, a disproportionate share of members and resources will be devoted to mending or avoiding the problems of growth. In either case, the growth and survival of the system are jeopardized.

Excessive Specialization

Specialization may refer either to the system as a whole or to activities within the system. Excessive specialization of the system as a whole increases the vulnerability to attack and limits the alternatives for future sources of action. Excessive specialization of the

numbers of the system or of the resources utilized by the system reduces internal flexibility. Such specialization forces rigidity, which reduces the ability of the system to respond to changes in the environment.

Ideology for Information

An expression of the envisioned role of the system in its environment may be termed the system's ideology. Specific goals represent reasonable expectations about what the system is capable of attaining. Ideology may involve a distortion of reality and a lack of rationality in collecting the potentialities of the organized behavior system. When such ideology replaces accurate information about what is happening within and without the system, the ability to properly evaluate the position of the system is destroyed. The implications of substituting fiction for facts are many. It increases vulnerability to attacks. It weakens the ability to respond to changes in the environment. Similarly it may interfere with the selection of effective strategies for meeting objectives. Additionally, it may often lead to misestimation in the capacity of the system. However, the fact should not be overlooked that ideology can play an important positive role in preservation of the organized behavior system; expectations of numbers based on belief in the ideology may hold the system together while it adjusts to changes.

CHAPTER IV

FORMAL ASPECTS OF ORGANIZED

BEHAVIOR SYSTEMS

Introduction

The relationships which exist between elements of an organized behavior system provide a framework for interaction within the system; interaction may be analyzed in terms of these relationships.

The relationships to be considered in the context of a given set of objects depend on the problem at hand, important or interesting relationships being included, trivial or immaterial relationships excluded. The decision as to which relationships are important and which are trivial is up to the person dealing with the problem. . . .

The relationships selected for consideration in this chapter are those involving communication and power. Employment of the concept of a subsystem will facilitate consideration of these two fundamental types of relationships. A subsystem has been defined as a subdivision of an organized behavior system. In other words, a subsystem incorporates certain sequences of behavior which are closely linked, even though they do not constitute an independently functioning system. The utilization permits concentrating exclusive attention on a particular

¹A. P. Hill and S. E. Fagan, "Definition of System," *General Systems*, ed. Ludwig von Bertalanffy and Anselm Kappeler, Vol. 1, New Archer, Chicago, Society for General Systems Research, 1954, p. 24.

aspect or portion of systemic behavior.

The relationships between elements of the system for communication and power purposes are vital to the functioning of the system. To provide an analysis of uniserial functions in terms of an organized behavior system, it is essential to comprehend these relationships.

Operationally it is difficult to separate them. A very high degree of interdependence exists and it should be recognized, at the outset, that separation is only an analytical convenience. Every communication relationship entails power; every power relationship, communication. Conceptually, however, they are separable. The position taken here is that a communication relationship must precede or accompany a power relationship; i.e., power is "communicated."

This chapter, therefore, will first present a description of the communication subsystem: the nature of messages, information and noise; the importance of redundancy, feedback, interpretation and memory of information, and storage of information; and the structure of the communication network.

The role of the power subsystem will then be presented, in terms of the sources of power and types of power structures. The factor of status will have a position in that analysis. The chapter will conclude with an examination of the interrelationships of the communication subsystem, or network, and the power subsystem, or structure.

Communication

Communication Defined

The phenomenon of communication is common to all levels of systems.

a "general theory of communication" is in the process of development.³ Although its principal applications thus far have been to technical systems, it may be beneficially applied to all systems. This analysis of communication within an organized behavior system is based, in part, on this general theory. Initially the communication process will be viewed as the transfer of messages between two or more individuals. It will then be expanded to describe the communication network of an organized behavior system.

"Communication" may be defined as the transmission of signs or signals and their interpretation by the recipient.⁴ In a very broad sense, it includes all procedures by which one individual may affect the behavior of another. The pattern of communication relationships forms a "communication network."

In organized behavior systems consists of individuals who communicate with one another by means of messages; further messages are received from the environment; information derived from messages is stored in certain facilities of memory. At various points in the system, major communication centers exist which are responsible for monitoring

³The two "classic" works were Robert Wiener, *Information*, New York, John Wiley & Sons, Inc., 1948; and Claude Shannon and Warren Weaver, *The Mathematical Theory of Communication*, Urbana, University of Illinois Press, 1949.

⁴Included within the concept of communication at the lower level are all gestures and facial expressions, along with the pitch and volume of speech, which accompany oral communication and the psychological factors which influence reception in written communication; e.g., the quality of paper, style of writing, form of the communication.

information, storing certain kinds of information, and sending and receiving specific types of messages.

Messages and Information

The term "message" in communication theory refers to a particular set of symbols or signals sent by one person to another. From the sender's point of view a message consists of "information"; from the receiver's point of view, a message consists of "information" and "noise." (Naturally it will be advantageous to assume that communications are transmitted via a noiseless channel, so that message and information may be considered as synonymous.)

"Information" is what is transmitted in any communication network.⁴ Strictly speaking, information is a measure of the sender's freedom of choice when he selects a message. A message does not convey information if the recipient can predict in advance what the message will be or when it will come.

The information which is communicated within an organized behavior system may be classified into four categories: (1) operating signals,

⁴The definition of "information" is not limited to standard forms of communication. Written memoranda and verbal exchanges are only one form of information. Manuscripts, budgets, part numbers and the like are another form. Materials and parts flowing through the factory or warehouse are legitimate units of information. In fact, any characteristic of an operation that can be observed and recorded constitutes potential information for the communication network. . . . Similarly, most of the routine activities of the organization will have their information-flow analog." P. W. Miller and K. L. Starr, Managing Decisions and Systems, John Wiley, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960, p. 12.

(2) answering signals, (3) instructing signals, and (4) social signals.

Operating signals.—The purpose of an operating signal is to initiate that new sequence of behavior should begin or should terminate. The issuance of an operating signal presumes that the recipient will understand the signal and know how to carry out the intended action.

Answering signals.—Answering signals are issued by the recipient of the initial operating signal to indicate that the operating signal has been received (and presumably, understood) or to report on the status of a particular operation.⁴

Instructing signals.—The purpose of instructions is to prepare members of the system for operating and answering signals, and for the performance of tasks within the system. Instructions are intended to teach individuals how to interpret operating signals which they will later receive, what action they will be expected to take upon receipt and what signals they should initiate when they have completed these actions.

Each of the communication within an organized behavior system will be concerned with instructions. The recipient, as well as the sender, must know the code or language that is being used. "Effective communication cannot take place if the same message conveys different perceptions to different persons."⁵ Effective and rapid communication also

⁴The relation of answering signals to feedback is considered below, p. 9.

⁵Harry E. Jasso, Organized Reciprocity Action, New York, John Wiley & Sons, Inc., 1961, p. 100.

necessitates that both the sender and recipient possess knowledge about the situation to which the information applies.

Social signals.—A certain amount of the information transmitted within the system is concerned with facilitating the interchange of operating, answering and instructing signals. Social signals are a means of establishing the conditions of "ready to send" and "ready to receive." They serve the purpose of indicating that the individuals are prepared to communicate with each other. In the technical sense of communication theory, social messages would have a low information value, for the content of such messages is usually highly predictable.

A certain amount of social communication within the organized behavior system is necessary to the functioning of the system and it is essential that it is maintained and protected. These social signals open the channels of communication and facilitate the transmission of "true" information, or signals relating to the specific systems goals.

Noise and Redundancy

It has been assumed, thus far, that messages have been transmitted via a noiseless channel. However, some degree of noise is involved in almost all communication. "Noise" in any element in any message which constitutes accidental or deliberate interference with the transmission of the message. "If noise is introduced, then the received message contains certain distortions, certain errors, certain extraneous material, . . ."² Accidental interference may arise from either the

²Shannon and Weaver, p. 129. Technically, communication theory only

channel or the nature of the language (code, signal, symbol) used.

Essentially speaking, it is possible to greatly reduce "channel noise"; efforts to reduce "language noise" meet with less success.

"Redundancy" is that portion of a message which is unnecessary. If it were missing the message would still be essentially complete (i.e., have nearly the same information), or at least it could be completed by the recipient.⁸ The conscious redundancy in a message is a result of either the accepted rules governing the use of the symbols in question or an attempt by the sender to overcome noise. Thus, redundancy is an indication of the extent to which the message contains signals in excess of what would be necessary for transmission in a noiseless channel utilizing a uniform-information-content language.

This study may be used to illustrate. It is likely that a certain portion—hopefully, a small one—of the words used to convey the author's ideas are redundant. If they were missing, the reader could still receive the main ideas. But the rules of the language require that ideas be stated in a given manner.⁹ Additional redundancy is included in this presentation because of acoustic problems; careful definition of terms

completely accidental interference. Deliberate interference will be referred to here as "distortion" and will be considered subsequently, p. 22.

⁸Ibid., p. 184.

⁹This redundancy permits the reader to detect violations of the rules and to overcome "channel noise" which results from the channel selected for communication; e.g., typographical errors, missing words or punctuation.

is an attempt to insure that the reader knows what the author means.

Feedback

The concept of feedback, which stems originally from electrical engineering, occupies an important position in communication theory. "Feedback" is the return of information about the output of one stage of a process to an earlier stage so as to influence its actions and hence to change the output itself.¹⁰

Earlier it has been stated that the incidence of an operating signal usually elicits an answering signal from the recipient. Such answering signals may be considered as a form of feedback. Effective communication requires that messages be returned, or fed back, from the point at which action takes place to the point (or points) where action was initiated. Thus, it is possible to view all communication in terms of a feedback circuit or an information loop—flow neither to receiver to sender.

All communications are initiated on the basis of certain expectations; i.e., the sender expects the receiver to take (or not take) certain actions upon receipt of the message. The response is feedback.

The expectations act as standards by which each person can gauge the extent to which he understands the other and is understood by him. . . . Feedback permits self-correction or adjustment of behavior in the light of the comparison between response and expectation.¹¹

¹⁰"The Language of Automatic Control," Scientific American, Vol. 187, No. 3 (September, 1953), p. 64.

¹¹John T. Denney, Jr., "A Communication Model for Administration," Administrative Science Quarterly, Vol. 2, No. 3 (December, 1957), p. 314.

The absence of an answering signal represents a second form of feedback. If the sender does not receive the desired action and/or an answering signal, then he knows that the communication has been ineffective. This form of feedback tells the sender that either the answering signal was not received or that it was too weak to stimulate the recipient to take the desired action.

Therefore, feedback increases the accuracy with which information is transmitted. Without feedback the sender is unable to determine if he has been understood and the recipient is unable to verify his reception. As a result feedback increases the confidence of the sender and receiver in what they have accomplished.¹²

Interpretation and Summary of Information

As the communication process is expanded from the simple sender-receiver model to the communication network of an organized behavior system, the importance of interpretation and summary of information emerges.

Every member of the system must interpret the messages which he receives; he must decide what action to take on the basis of the information contained in the message. Usually this action will consist of issuing answering signals to the initiator, and operating or interpreting signals to other members of the system. In addition, the member will

¹²A. J. Lewin and E. Mollat, "Some Effects of Feedback on Communications," *Human Relations*, Vol. 4, No. 4 (December, 1951), p. 412.

combine messages from various sources, both internal and external, and transmit summaries of this information. As information moves from the periphery of the system toward the center, more and more details will be omitted and a greater and greater number of messages will be included. Conversely, messages moving out from the center will generally be expanded as information is added to the original message.

To bring order to the process of interpretation and summarization, certain rules or policies are established which a system to handle types of messages which occur frequently or repetitively. Such instructing signals express short rings of interpretation and summarization should be applied to various types of messages.

Storage of Information

An organized behavior system does not possess a memory, in the proper sense of the term. It is more accurate to describe the retention of information which an organized behavior system as a matter of storage. The system may rely on the collective memory of its participants. This, however, is usually insufficient for the needs of the system because: (1) that in its own memory is not necessarily available to others in the system, and (2) when a member leaves, the system loses part of its memory.¹⁸

Therefore, artificial memory or storage centers are established. They become the repository for instructing signals, feedback (information

¹⁸Herbert A. Simon, *Administrative Behavior*, 2nd ed., New York, The Macmillan Co., 1957, p. 155.

on previous operations within the system), and communications with elements of the environment. In specifying the storage facilities of a particular organized behavior system, it is necessary to establish what and where information is stored, how it is selected, and where and how stored information is used.

Communication Network

A communication network is formed by the pattern of communication relationships which exists within an organized behavior system. When viewing the system as a communication network, all characteristics and relationships of the system are ignored except those involving the handling and transmission of information by members of the system.

The network of a specific organized behavior system may be established by plotting the flow of information, both written and oral, over a period of time. The pattern of points thus connected represents the communication network. Members of the organized behavior system who are involved in a regular, repetitive pattern of communication flow that may be referred to as a "channel."

Some persons in a channel play a passive role with respect to the content of the message. They transmit the message to another person who may be the ultimate recipient or yet another link in the channel. Other persons add to, subtract from, modify the content, or change the form of the message before transmitting it to another person.¹⁴

The number of channels to which a member or a party will depend upon his functions in the operation of the system.

¹⁴Adams, p. 216.

Every member of the system will have a position in the communication network for each person, to a varying degree, is a communication center with both an influx and outflow of information. Each member will "seek, receive, transmit, subdivide, classify, store, select, re-call, recombine and retransmit information."¹⁴ Also, individuals and the channels linking them will tend to become specialized as to the kinds of information which are received and the operations which are performed in connection with these messages.

The network of channels and members does not necessarily correspond to the structure of other relationships within the system. Different types of messages will not necessarily follow the same channel. As a result, the same channel of communication will not be followed in making all decisions or carrying out all programs of an organized behavior system.

The structure of communication relationships within an organized behavior system is consistently developed. That structure bears certain relationships to other structures within the system and to the position of various members of the system. Before analyzing the establishment of the communication network, it is desirable that the power subsystem be considered.

Power

Power Defined

Power relationships are the second fundamental type of relation-

¹⁴ Harvey, p. 217.

ship among members of an organized behavior system. Just as in the preceding section where attention was given to the question of the communication network, this section will explicate power relationships and seek to describe the power structure, which exists as a sub-system within an organized behavior system.

At various points in this study it has been possible to adopt a "general theory" to the needs of the discussion. This is not the case with regard to power. Although there are many writers who have considered the nature of power and the closely related concept, authority, there is wide disagreement as to which interpretation is the "correct" one. It is therefore necessary to undertake here a digression into the nature of power and authority.

Sam has properly stated the situation: "It would be a hopeless task to present a review and critical evaluation of the multitude of definitions and data regarding the concept of authority."¹⁴ The range of opinions on the subject of authority may be dichotomized into the "classical" position and the "acceptance" position.

The "traditional approach" to the analysis of managerial functions has subscribed to the "classical view." The traditionalists consider the nature of authority to be the right to see that tasks are accomplished. For example, Ralph L. Davis defines managerial authority (as distinct from operative, or non-managerial, authority) as: "the right

¹⁴Harold A. Sam, *Reorganization of Authority in a Corporation*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1942, p. 18.

to plan, organize and control the organization's activities for which the executive is responsible.¹⁷ In brief, this consists primarily of the rights of decision and control. He considers authority and power to be related, but different. "Executive authority is a business is a right that is exercised by virtue of the position of a higher authority. Power is the force that enforces that right."¹⁸

Another follower of the traditional approach, George E. Toney, states:

Authority is the power or the right to act, to command, or to exact action by others. In management, authority can be thought of as the power to exact others to take actions considered appropriate for the achievement of a predetermined objective by the possessor of the authority. Implied is authority is the power of making decisions and seeing that they are carried out. Compliance as a result of sufficiently applied power is included in the concept of authority.¹⁹

The "classical" view of authority, espoused by the traditionalists, bases authority—and hence, power—on the institution of private property. The basic argument may be expressed as follows: authority (and power) go with the right of ownership; owners of property hire individuals and pass those rights onto them; a chain of command develops with each individual having somewhat less authority than his superior.

The "acceptance" view is that the authority of an individual is

¹⁷*The Fundamentals of The Management*, New York, Harper & Bros., 1942, p. 101.

¹⁸*Ibid.*, p. 107.

¹⁹*Principles of Management*, 3rd ed., Homewood, Illinois, Richard S. Irwin, Inc., 1943, p. 104.

determined by his subordinates.

Authority is the relationship that exists between individuals when one accepts the directive of another as authoritative, that is, when the individual accepting the directive weighs the consequences of rejecting it, and decides in favor of acceptance. The authoritative nature of the directive is confirmed when the person accepting the directive acts in accordance with it, within the confines of his understanding and ability.

The two principal proponents of the acceptance authority concept are Chester I. Bernard²¹ and Robert A. Merton.²² To them, and their followers, authority is based on the willingness of subordinates to obey or the voluntary acceptance of commands as governing influences for behavior. Merton introduces power when he defines authority as "the power to make decisions which guide the actions of another."²³

Neither the traditionalists nor the acceptance school have been able to successfully separate authority and power. As stated above, the traditionalists hold authority to be the power to act, to command or to exert action from others. An adherent to the acceptance approach, who first specifically rejects the classical view, goes on to state: "authority amounts to the power to make a decision that will be accepted and carried out. A decision may be altered by a higher or ultimate authority but this factor does not negate the existence of

²¹Daniel J. Boffy, "Authority Considered from an Operational Point of View," *Journal of the Academy of Management*, Vol. 1, No. 1 (December, 1956), p. 161.

²²*The Functions of the Bureaucracy*, Cambridge, Massachusetts, Harvard University Press, 1936.

²³*Administrative Behavior*, 2nd ed., New York, The Free Press Co., 1957.

²⁴*Ibid.*, p. 158.

authority to the first instance."²⁴

Both of this disagreement (and confusion) is unnecessary. In addition to the attempt to distinguish the source of authority, it results from attempting to specify authority in such a way as to encompass both "forced" and "informed" power. That the debate can be resolved with finality is doubtful. However, for the purposes of this study it is more meaningful to consider the concept of power in organizational behavior systems in terms of power relationships. Therefore, a definition of "power," along with a definition of "power structure," is presented below as these terms will be used here.

"Power" is the ability to act (in given ways in a given class of situations) and/or the possession of controlling influence over others. It should be made clear that the term power includes two aspects: (1) the ability to act—that is, to perform certain duties, tasks or functions within the system, and (2) the possession of controlling influence over others.²⁵

Both are important to this analysis. However, as there is relatively little disagreement on the "ability to act" phase, the major portion of this analysis is devoted to the matter of influence. In

²⁴ibid., p. 35. (Gross does not account for the willingness of the subordinate to accept this higher or ultimate authority.)

²⁵In the latter sense, power may be exercised in any of three forms: the power-holder may attempt to utilize physical force to obtain subordination to his desires; to dominate through explicit statements of his desires; or to manipulate others to secure his desired aims.

individual member's power primarily represents the extent to which he may influence the behavior of other members of the organized behavior system in accordance with his own intentions.¹⁶

The principal, but not exclusive, concern here is the formation of power relationships among members of an organized behavior system. Issues are brought to the following questions:

1. What are the sources of power?
2. In what way may the power relationship operate?
3. What power structures develop within a system?

Their consideration will prepare the way for an explanation of the evolution of the power subsystem within organized behavior systems. A "power structure" is the pattern of power relationships which exists within an organized behavior system and which is relatively stable and continuous over a period of time.

Sources of Power

The basis of interpersonal power is the more or less enduring relationship between two (or more) members of the system. "The power of A over B [with respect to a given opinion] is equal to the maximum force which A can induce on B minus the maximum resisting force which B can exhibit in the opposite direction."¹⁷

¹⁶Harbert Goldhamer and Edward A. Shils, "Types of Power and Status," American Journal of Sociology, Vol. 46, No. 2 (September, 1940), p. 173.

¹⁷John L. F. French, "A Formal Theory of Social Power," Sociological Inquiry, Vol. 40, No. 2 (May, 1950), p. 181.

The sources of such power are: (1) attraction—one member's liking for another, (2) expertise—one member's perception that another has superior knowledge, ability, or information, (3) reward—one member's ability to secure rewards for another, (4) coercion—one member's ability to punish another, and (5) legitimacy—one member's perception that another has a "right" to prescribe his behavior, opinions, actions and so on. The perception of legitimacy of power is based, in turn, upon: (a) a belief in the legitimacy of the decisions and commands issued by the power-holder; (b) a belief in the sanctity of traditions; or (c) a devotion to the personal qualities of the power-holder.²⁰ Thus it would be possible for a member of an organized behavior system to hold power based on his attractiveness and expertise, and for this power to be reinforced by a willingness on the part of subordinating members to regard the power-holder's efforts to influence their behavior as legitimate.

The parties to a power relationship do decide whether or not to accept the relationship. That is, the question does arise as to whether or not an individual will submit to subordination. This, however, is very close to the question of whether or not to associate with a given organized behavior system or subsystem. Acceptance is determined at the time of associating (or dis-association), not each time the power-holder issues a directive.

Activation for acceptance of the power relationship may be

²⁰Gallagher and Mills, p. 157.

rational or non-rational. If acceptance is made on a rational basis, then the subordinating individual has acted in anticipation of the potential gains and losses which will result from the relationship. Non-rational acceptance is made without questioning the legitimacy of the power or as a result of the attraction and/or repulsion of the power-holder.

A necessary and meaningful distinction can be made between "formal power" and "informal power." It will be recalled that this is one of the points of contention between the classical and acceptance positions. Efforts to resolve the issue lead to statements such as "Power . . . $\hat{=}$ the ability to determine the behavior of others, regardless of the basis of that ability. Authority . . . $\hat{=}$ that type of power which goes with a position and is legitimized by the official norms."¹⁸ If this interpretation is adopted, then "authority" is legitimate rational power, and "power" is unauthorized, non-legitimate control.¹⁹ This must be rejected!

Power, formal or informal, is authorized and is legitimate; members of the power relationship have accepted the relationship. This is considered to be valid regardless of the basis of the power. As Fieser has stated:

¹⁸James E. Thompson, "Authority and Power in 'Classical' Organizations," *American Journal of Sociology*, Vol. 45, No. 3 (November, 1944), p. 370.

¹⁹Ibid., p. 34. Does this mean that "authority" is legitimate, rational, authorized, non-legitimate control?

. . . The distinction between the formal and the informal . . . appears to lie, in part, in differences between the psychological bases of cohesion that are involved. When we refer to power as formal, what we appear to mean is that institutionalized attitudes toward legitimate authority provide the motivation for acceptance of the relationship.¹²

This places the issue in the proper perspective. The sources of power do not change; they are the same for formal power and informal power. The difference is one of degree. These differences are most clearly seen in connection with the discussion of the power structures to which they give rise.

Types of Power Structures

Formal structure.—The "formal power structure" within an organized behavior system is a linkage of the persons who possess formal power. The structure involves a chain of power-holders. When the nucleus of an organized behavior system is formal, the manager possesses formal power. Individuals who choose to associate to form the nucleus have accepted the relationship as subordinate. They recognize the manager's formal power, which is based mainly on legitimacy, rewards and sanctions. Thus, these individuals consider the manager to have a legitimate and authorized right to power. Furthermore, if the acceptance has been made on a rational basis, they specifically recog-

¹²Maxwell A. Murnighan, "Comments on the Theory of Organizations," *American Psychologist*, Science Series, Vol. 44, No. 4 (December, 1989), reprinted in *New Journal of Organizations*, ed. Albert M. Schminke and Charles J. Hirschfeld, Homewood, Illinois, Irwin and Davis, 1990, p. 183.

also his ability to control efforts is conformity with his intentions and to make reprisals for non-conformity.¹⁸

The power-holder's ability to control and sanction results from the chain of power. It is a result of decentralization, the process of creating subordinate power-holders. He acquires this ability through his relationship to a higher power-holder, who has received his ability from the central manager of the system.

Thus, the formal power-holder may be said to receive his power from above. Subordinates have the choice of accepting or rejecting the power relationship. Yet, regardless of their choice, the power is retained by the power-holder, until revoked by his superior.

The conception of formal power involving a chain of power-holders is applicable to all types of organized behavior systems, although some types may require a slight modification of the above analysis. For example, in a voluntary organization or in government the manager of the system is an instrumentality of the organized behavior system. The specific power of the manager is determined collectively by the members of the organization or the electorate at the time of designation. Thus the manager is at once both superior and subordinate to the members or electors. So long as he acts in accordance with his powers and/or his original power grant is not changed, he is their superior.

¹⁸ These reprisals, or sanctions, will be either (a) the deprivation of values already possessed, or (b) the destruction of the attainment of anticipated values.

However, the members generally retain the power to revoke his peer grant or to remove him from his position and, in this sense, he is their subordinate.

Informal structure.—The informal peer structure within an organized behavior system results from a different process. A chain of power, as such, is not involved.

Individuals who associate recognize one of their number to hold power over the others mainly on the basis of attraction and expertise. Once the individuals have accepted (literally, formed) the relationship, the informal power-holder's power is legitimate and authorized. His ability to reward and sanction efforts of members of the informal structure is a function of their willingness to remain in association. The more firmly attached he becomes, the greater is the informal power-holder's ability to reward and to sanction.¹²

The nature of informal power is more highly personal than is formal power. It is more difficult to delegate informal power, as the source of that power lies in the personal attractiveness and expertise of the power-holder. Thus, the informal power-holder in effort revokes his power from below. If the subordinated individuals reject the relationship, he loses his power.

Summary.—Both formal and informal power structures exist within a specific organized behavior system. Every organized behavior

¹²In earlier, sanction is used in the positive sense; it represents reprimand, not approval.

system will have one formal power structure and a multiplicity of informal power structures.³⁴ This is a consequence of the differences in the nature of the power.

The formal power structure develops as a chain of power-holders, each receiving his power from his superior. Every member of the organized behavior system will have a position in the formal structure. He will have power to act in given ways in a given class of situations and may have formal power to influence the behavior of other members of the system.³⁵

The informal power structure does not involve a chain of power-holders. Members of the organized behavior system may belong to one or more informal structures, or may even belong to none. Through multiple membership in several informal structures, certain members of the system may lack informal structures.

Due to the differences in origin, the formal power structure is likely to have greater stability and continuity than the informal structure, which will probably have greater flexibility and freedom of action.

³⁴In exception any group in very small systems where, in addition to the one formal power structure, only one informal power structure might exist.

³⁵Every member of the system has the power to perform his duties; he has formal power to influence only to the extent that he has subordinates in the formal chain of power.

Status and Power

"Status" is the position of a member of a group in relation to other members of the group. Each individual in the system has status, in the sense of his status, each member holds expectations concerning his participation in the system's activities and the other members hold expectations concerning his behavior.

The status which an individual comes to hold in the organized behavior system is related to his possession of power, formal or informal. Formal power specifies an individual's place in the hierarchy. If for no other reason, he holds status in terms of that position. A parity between status and formal power, however, does not necessarily exist. Other members of the organized behavior system will tend to evaluate the utilization of that power (as well as other characteristics) and modify their evaluation of the power-holder's status. In the extent that individuals freely evaluate the use of formal power, the power-holder increases his effective power.

Managers have what may be termed "dual status." Each manager is a member both of a group in which he is the superior and of another in which he is a subordinate. His status in each of these formal groups is affected by his status in the other. The greater his status in one, the greater his status in the other.

The relation between informal power and status is not as easily stated in a cause-and-effect manner. An individual's informal power is his status, or vice versa. The member's ability to influence the

behavior of other members, when based upon informal power among those members, is an indication of his status. To the degree that he holds status, he comes to hold informal power, which is a collective evaluation by the group of his status.

Interrelationships of Communication and Power

To facilitate analysis the preceding discussion has sought to separate communication and power, considering each as a separate subsystem which exists within an organized behavior system. Now that restriction is relaxed, in an effort to consider some of the more important interrelationships which exist between the communication network and the power structure. The following discussion is confined to the formal power structure. The relationships between the communication network and the informal power structure should be describable on the basis of that discussion and, therefore, separate discussion is not necessary.

The communication network which exists within an organized behavior system may or may not parallel the power structure. A formal communication network will be established by the holders of formal power, but even this network will not necessarily be identical with the formal power structure. However, the power relationship cannot exist without communication (power is communicated) and, hence, a large part of the communication network will correspond to the formal power structure.

The communication network is utilized by the formal power structure in many ways. First, the power-holder attempts to secure compliance through communicating his intentions to his subordinates. The process of influencing behavior depends upon the communication process. The power-holder issues operating and instructing signals to inform his subordinates what action to take, when to take it and how to take it.

Second, the formal power chain must use the communication network to coordinate activities within the organized behavior system. The functioning of the system is dependent upon the flow of information to and from the central manager. Therefore, in addition to issuing signals, the central manager (and the intermediary managers) receives an influx of signals. Some of these are from elements in the environment. Others are answering signals from members of the system and/or feedback, reporting on the present state of operation. Interpretation and construction of the influx facilitates the orderly operation of the communication and power subsystems.

A third use of the communication network by the power structure is detrimental in nature. This is the use of communications for aggrandizement of the power-holder's own position. In any human communication message is the attempt to discredit his rivals or is the attempt to displace his superior. Or, efforts in these directions may consist of suppressing messages favorable to the individuals concerned. Suppression of messages is also a form of retaining or increasing one's power position.

If the formal communication network is limited to the formal power structure, serious consequences are generally anticipated. For that reason, the communication network is often specified in such a way as to provide for skipping certain links in the power chain.

The term "noise" has been used to characterize interference with the transmission of information. Accidental interference is an inevitable result of communication and power following the same channel. Power is not separable from the individual; the individual's communications are effected by the power which he holds. Messages moving through any channel consist in part of noise, but using a power channel for communication tends to increase the portion of noise.

Deliberate interference with the information may be referred to as "distortion," when the communication channel is controlled by the power-holder, he is able to distort messages flowing through the channel. For instance, he is able to suppress or change information about failures, to protect himself either directly or indirectly.

Additionally, the process of assimilation of communications flowing through the network facilitates "quasi-deliberate" distortion. When the formal power structure is the formal communication network, information has normally been transformed at intermediate nodes or times before reaching the ultimate recipient. This is especially crucial when the information is concerned with activities occurring at the fringes or with changes in the environment of the system. The time lag, as the information works its way through the power structure, impairs the system's ability to take effective action.

A more extensive review of the interrelationships between communication and power may be undertaken after the structure of the operating subsystem of the organized behavior system has been presented. That task is undertaken in the next chapter.

CHAPTER V

ANALYTICAL ASPECTS OF ORGANIZED BEHAVIOR SYSTEMS

Scope of an Organized Behavior

The concepts of an "operating subsystem" and an "operating structure" have a place beside those of a communication network and a power structure in the present approach to the analysis of non-social functions. The interaction among elements of an organized behavior system, and the relationships which result from such interaction, may be considered in terms of the operations that take place within the system, as well as in terms of communication and power.

Once again the analytical device of a subsystem will be employed to concentrate attention upon a particular class of relationships which exist within an organized behavior system as it functions within its environment. When analyzing an organized behavior system in terms of its "operating subsystem" the focus is upon (1) the inputs and outputs of the system, and (2) the structuring of processes within the system to achieve anticipated goals, approaching efficiency.

It has been fundamental to the entire analysis thus far that an organized behavior system exists to attain some goal. In general terms this has been expressed as the provision of a surplus of satisfactions

for its members over what they could obtain through individual, isolated action. To produce such satisfactions certain operations must be undertaken within the system. Therefore, it may be observed that:

The behavior displayed by a system consists of a set of interdependent acts which constitute its operation. . . . Loosely put, a set of acts can be said to constitute an operation if such act is necessary for the occurrence of the desired outcome and if these acts are interdependent.¹

The necessary and interdependent acts and operations which are performed within an organized behavior system occur in some sequential order, with different members performing different tasks. The relationships which link the operations—and the members performing those operations—one to another result in the formation of an "operating structure."

The operations undertaken within an organized behavior system should determine its operating structure. Although it is likely that the operating structure will also influence the operations undertaken, the basic cause-and-effect relationship is one of the operating structure being the effect and the operations, the cause.

The subsequent analysis will generally convey the impression that the operating structure is taken to be static in nature. This is a necessary restriction upon the present analysis.² It is important to

¹Donald E. Schaff, "Systems, Organizations and Interdisciplinary Research," *Systems Research and Design*, ed. Donald E. Schaff, New York, John Wiley & Sons, Inc., 1961, p. 38.

²This is in keeping with the earlier discussion: "Whatever field of inquiry is chosen, the foundation for further analysis is built upon an accurate description of those static structures which comprise the field." (Above, Chapter II, p. 27.)

note, however, that while the analysis is in static terms, this is not the same as treating the structure as "closed." The operating structure (and the organized behavior system of which it is a part) is both open and closed. It is this dual nature of the system which enables it to function—to grow and to survive—in a changing environment. Thus, an organized behavior system is closed in the sense that it has a complicated operating structure for the discharge of its functions. But it is open in the sense that growth (the expansion and/or the improvement of operations) may occur.

Earlier it was desirable to draw biological analogies to refer to the origin, growth and survival of organized behavior systems. Similarly, the operating structure may be thought of as the anatomy of the operating subsystem, while its operations represent the physiology. The level occupied by organized behavior systems in the "system of systems" scheme of General System Theory is one of those which represent living systems, all of which may be characterized as being capable of self-maintenance under input-output conditions.

Inputs and Outputs

The input-output concept has been developed to various degrees in several areas of knowledge. It has been used, for example, in economics to describe the interdependence of various sectors of an economy. Its use in electrical engineering in designing and analyzing electrical circuitry has long been established. Particularly in recent years, the

application of the terminology is conjunction with computers and mathematical programming has become widespread.

The purpose here is not to specify the inputs and outputs of various organized behavior systems. It is rather to call attention to the importance of the input-output concept as a suitable tool for this analysis.

A characteristic shared by all behaviour systems is that, in order to survive themselves, they have to set up some form of reciprocal relationship with their environment. More specifically, the input they obtain is dependent on the output that they supply to the environmental units with which they are linked. Within the system itself input and output are linked by internal processes of distribution and transformation.

Thus, the input-output concept may be employed in two ways. First, it may be considered in terms of an exchange between an organized behavior system and its environment at the boundary. Second, it may operate in solidifying the links between various processes (or stages of a process) internal to an organized behavior system. Consideration of inputs and outputs as the terminal points of any process sequence both, then, the point of exchange is at the boundary. It is easier to visualize. Internally, however, any two points within the system may be selected as the beginning (input) and ending (output) points of a process.

The analysis of a particular operating subsystem, or input-output

¹Y. C. Ebert, "Measurement of Behaviour Structures by Means of Input-Output Data," *Human Factors*, Vol. 20, No. 4 (November, 1977), p. 522.

system, should begin with a specification of the outputs. The output of a system establishes the overt purposes for which it exists. The inherent purpose of any organized behavior system is the provision of a complex of satisfactions and the outputs represent the way in which these satisfactions are sought. With the output given, it is possible to infer the necessary inputs, or at least a range of possible inputs. With both inputs and outputs given, the structuring of processes within the operating subsystem becomes determinable.⁴

Regardless of the specific organized behavior system considered, an operating structure will evolve. Such a structure will have certain characteristics in common with the operating structures of all other organized behavior systems. It is possible to analyze the nature of operating structures without reference to a particular organized behavior system, or even a particular type of system. This analysis is the subject of the subsequent portions of this chapter.

Origin of Subsystems⁵

The structuring of processes within an organized behavior system

⁴In the process of analyzing a specific system, some writers utilize the term "black box" to describe a system whose structure is unknown. The term originated in classified engineering where it is used to denote unspecified structure. Such writers would begin by assuming that the structure is covered by a black box and therefore unknown. For examples of its use, see Herbert L. Spence, *System Analysis for Systems Engineers*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960, or E. V. Miller and R. L. Page, *Operative Systems and Operations Research*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960.

⁵Reference here is to subsystems of the operating subsystem. Potential confusion could be introduced by referring to these groups within the operating subsystem as "sub-subsystems." But the use of "sub-subsystem" would be very tedious and the slight gain would not be significant.

involves the assignment of particular functions to various members or groups of members (subsystems) within the system. The assignment of activities is a manifestation of: (1) the desire of the members for orderliness in their activities; and (2) the necessity for a division of labor within the system to facilitate the efficient conversion of inputs into outputs. The resultant operating structure reflects the distribution of the total task among the members of the system. It indicates the way in which members and groups of members are linked for the performance of various activities.⁶ That operating structure will not be identical with the power structure *unless* the communication network of the organized behavior system, although there will be definite similarities.⁷

Each group of members will have a goal, explicit or implicit, which represents the purpose for which they have been designed particular activities. Just as the assignment of tasks is a factoring of the total activities of the system, the assignment of goals to subsystems is a factoring of the specific goals of the organized behavior system. Individual members are therefore able to evaluate their individual actions in terms of the particular output allocated to their subsystem, rather than in terms of the goals of the organized behavior

⁶Robert S. Weiss, "Structure Function Approach to Organization," *Journal of Social Issues*, Vol. 15, No. 1 (1959), p. 48.

⁷These are pursued in the concluding section of this chapter, for the moment the power and communication relationships within the system are excluded.

system.¹¹

Division of labor

The development of subsystems within the operating structure is basically a matter of division of labor. A variety of meanings may be implied by the term "division of labor." It is sometimes used to denote a number of people performing identical tasks. Other times it is used to refer to each person performing a separate, distinct operation. Sometimes it means the specialization of labor, in the proper sense of that term; i.e., the employment of individuals who possess skills which can be developed only through significant periods of training and/or experience. Still other times, division of labor is used to refer to the standardization and routinization of tasks.

If these various meanings only two are antithetical: that which implies a specialization of labor and that which implies a specialization of tasks. The division of activities into a number of relatively small and simple tasks leads to routinization with each worker performing a distinct operation. The extent to which a number of workers are employed in completing the same task is a function of the size of the organized behavior system and the importance of that task to the total output of the system.

In saying I agree with each of these meanings of the division of labor

¹¹Victor A. Thompson, Modern Organizations: A General Theory, New York, Alfred A. Knopf, Inc., 1965, p. 11.

has an impact upon the operating structure which will evolve within an organized behavior system. The nature of the activities undertaken within the system—and, hence, the relative importance of each type of division of labor—will influence the establishment of a particular structure.

To the extent that the operations of an organized behavior system consist largely of the conversion of physical inputs to outputs, the applicable technology will dictate the division of labor. Where technology is not the most persuasive factor, the division will be based upon tradition, the practices of others, the experience of members of the system and other less predictable factors.

Therefore it is not possible to state with specificity the operating structure for all organized behavior systems. It is possible, however, to identify the bases of the division of labor which may be utilized. The extent to which these bases are discernible within a specific organized behavior system is dependent upon the nature and size of that system; the larger the system, the more readily apparent are the bases of division of labor.

By type of input.—Division of labor by type of input is the most commonly encountered. More than any other it takes advantage of the specializations of members of the system. The specialized skills of members represent types of input, as do the more tangible inputs which may be utilized by the system. It is possible to identify subsystems within the operating structure which rely upon the specialization of their members and are responsible for: (1) the conversion of inputs

into outputs; (1) the distribution of those processed inputs (the outputs) at the boundary; and (2) the provision of vital facilitating activities.⁹

In stages of process.—When the operations involved in the processing of inputs are particularly well-suited to stimulation and revitalization, members may be allocated according to stages of the process. Although this is in essence similar to division on the basis of type of input, the important implication of division by stages of the process is that it is primarily a specialization of tasks, not a specialization of labor. Therefore it implies that each member will be performing a relatively small operation, resulting in a high degree of interdependence among members of the subsystem. The quantity and quality of output at each stage will thus have a large influence upon the output of the next stage.

By segments of output.—Where the output of the organized behavior system may be clearly differentiated, the grouping of members may be based on segments, or types, of output. Thus, where a system needs to provide a variety of distinct outputs, the division of labor

⁹These subsystems are most easily identified in business firms, which represent a type of organized behavior system. These subsystems are the responsibility of production; distribution, of marketing; and facilitating, of finance. Yet application of these concepts is not limited to business firms. Such divisions are identifiable in other types of organized behavior systems. For example, universities have subsystems responsible for "production" in the form of research; output for "distribution," in teaching and publication; and for "facilitating," in administration.

is likely to be based upon the features of these outputs.¹⁰

By absolute numbers.—The division of labor by absolute numbers is the latest complex base for the achievement of adaptiveness. It is utilized in organized behavior systems, or in those portions of the operating subsystems, where specialization of labor is relatively unimportant and the sheer volume of the tasks to be completed is preponderant. Its success usually rests upon the ease of adjusting the variability of numbers to the needs of the operating subsystem, which in turn is dependent upon the possibilities for reducing the complexity of tasks through standardization and routinization.¹¹

By spatial separation.—A "natural" division of labor may occur within an operating subsystem when activities of the system are widely dispersed. Members of the system may then be grouped on the basis of location. The desire for coordination of activities on that basis may often take precedence over the utilization of other bases.

The adoption of a particular base does not preclude the utilization

¹⁰For example, universities are concerned with a number of different types of education. Although the division of labor is often thought to be based upon types of input (i.e., the specializations of the faculty), analytically the division results from separation of the output. Thus different colleges, schools and departments are responsible for different outputs.

¹¹For example, a specific type of organized behavior system which employs division of labor by absolute numbers is the military. The members of an army are divided into platoons, companies, battalions, divisions and so on. This division is based on a certain number of men per unit, each higher unit composed of a specified number of sub-units.

of others. In the contrary, the operating structure of a specific organized behavior system will likely include some combination of the means of division of labor. The attempt will be made to divide and group the operations of the system so that they contribute most effectively to the attainment of its specific goals.

Routinization of Tasks

The origin of subsystems and the division of labor are interdependent with the routinization of tasks within the organized behavior system's operating structure. Although division of labor may occur without routinization and vice versa, there is a very marked tendency for one to derive the other. Effective division of labor requires a routinization of activities; routinization induces the development of a division of labor.

Advantages of routing.—The effective operation of the input-output system of an organized behavior system requires that operations within the system be routinized; i.e., specified procedures for the performance of activities which occur regularly and repeatedly within the system must be established. Many advantages accrue from routinization.

Increasing specialization of tasks is facilitated by routinization. By detailing the way in which activities are to be carried out, it becomes easier to divide the task and to assign portions of it to various members of the system. Repeated performance usually leads to increased competence.

As a corollary, routinization reduces the number and complexity of decisions which must be made by members in the performance of their tasks. The predictability of their behavior is thereby enhanced, which reduces the potential for conflict within the system.

Routinization of tasks also affects the way in which the versatility of members is adjusted to meet the needs of the system. Having reduced operations to a series of specified acts, it becomes easier to instruct a member in the performance of his tasks. It should be noted, however, that routinization also increases the need for adjusting the versatility of the member to the system, rather than the reverse.

The opportunities for increasing the efficiency of the input-output system are related to routinization. The reduction of a complex operation to a routine permits standardization which, in turn, may foster mechanization and/or improved control with the elimination of waste. If the inputs expended upon control are less than the waste eliminated, efficiency of the operation improves. Rational adaptation of mechanization implies an increase in efficiency.

Furthermore, routinization brings stability and continuity to relationships and orderliness to activities. As these are directly related to the factors which foster association, they tend to strengthen the system.

Disadvantages of routine.—Routinization entails disadvantages, as well as advantages. In one way or another all of the advantages of routinization may threaten the survival of the system. By its very

nature, mechanization reduces the flexibility and increases the specialization of the system. Hence such an operating subsystem can perform best in a stable environment which does not necessitate frequent changes in the operations of the system.

It is therefore possible to generalize that there must be a direct relationship between stability of the environment and the degree of mechanization of activities within the system. Moreover, it is possible to relate the degree of mechanization to the rate of growth for the regulated behavior system as a whole. The slower the rate of growth, the higher the degree of mechanization which the system may tolerate.

Elements of Structure

Basically function determines structure. Structural possibilities, however, affect the method of operation or at least set limits within which functions must be performed. Therefore, in addition to the division of labor and the mechanization of tasks, an analysis of the origin of subsystems in the operating structure must take into account the elements of structure.

The basic element of structure within an organized behavior system is the member; i.e., the member is the unit which must be used to form the structure. The primary pressure which determines the shape of the operating structure is the amount of work that one member can

do, for that is the irreversible unit of structure.¹²

Thus the operating structure may be said to result from the distribution of operations (functions), which probably have been routinized, to individual members and the methods chosen for linking those members together. In the preceding discussion of the division of labor has indicated, there are a number of bases available for that process.

But more than the division of labor is needed for the construction of the operating structure. The operating relationships between members must be established. These relationships are considered here as separate from the function of the power structure and/or communication network. The function of an effective operating structure requires such operating relationships and they may be analyzed distinct from other relationships in an organized behavior system. The power structure and communication network are interrelated with the operating structure; these considerations, however, will be taken up subsequently.¹³

Some members of the organized behavior system are responsible for more work than one member can perform. Such a member has other members responsible to him for the performance of their tasks. In this way the

¹²The absolute amount of work which a member can do is dependent upon a number of factors and will vary to the extent that they are present. His abilities and needs will affect the amount of work, as will the physical resources which are made available to him in the performance of his duties. Such factors, however, do not negate the proposition that the amount of work which one member can do is the irreversible unit of structure.

¹³Ibid., pp. 127-128.

operating structure encompasses a series of superior-subordinate relationships. Some members will have no subordinates in the operating structure; they are responsible for the operations assigned to them and no more. There is one member who is subordinate to no other in the operating structure.¹⁴ Certain members will have responsibility for the work of their subordinates and be responsible themselves to some other member of the system.

Any member who is responsible for more work than one member can do—that is, who has subordinates—engaged in the activity of managing. He is involved in getting things done through the efforts of other people. Therefore, in addition to whatever technical operating functions he may have, the manager must also be concerned with the objectives of his subordinates and with the determination of methods for attaining these goals. While it is possible to consider any of the members of the operating sub-system simply in terms of performing those operations directly required by the input-output process, members with managerial responsibilities warrant additional consideration.

Attention may likewise be concentrated on functional relations that the persons which they are designed to serve is observed. Functions should be seen in relation to purpose. The manager's responsibilities must involve him in making decisions about the operations carried out

¹⁴The expression "one member" is used in the analytical sense; it may represent a number of individuals if necessary, such as a board or committee.

by his subordination. That purpose is embodied in the nature of decision centers which exist within the operating structure.

Decision Centers

Every member of an organized behavior system must make decisions concerning his behavior as a member of the system. Those members of the system which occupy positions with managerial responsibilities, however, must make decisions concerning the behavior of others, as well as decisions about their own behavior. It is possible to think of managers as occupying "decision centers" or positions in the operating structure which, as a regular part of the operations of the system, make decisions. It is assumed that such decisions may be interpreted in teleological terms; i.e., a certain action is chosen to attain a specific goal. It is implied therefore that rationality is present in the process; the choice is based upon an evaluation of a state of affairs and a range of possible outcomes.

The number of decision centers will vary and, with the exception of very small systems, there will be a hierarchy of centers. To mention a device used earlier, it is convenient to think of the operating structure as a series of concentric circles, with the innermost position occupied by the control manager, or primary decision center. A particular issue will be decided at that decision center which has the capacity to make the decision, being referred forward until such a center is reached.

Strategic and Routine Decisions

The decisions which must be made within the operating system may be divided into two groups, routine and strategic.¹⁵ "Routine decisions" are those which can be repeatedly made with no essential change in form. This is not to imply that they are unimportant or unimportant. Rather it is that routine decisions are concerned with recurring situations, those which are necessary to keep the system operating at a given level of output.

"Strategic decisions" deal with non-recurring situations; they generally affect a sequence of activities and usually involve a significant amount of uncertainty as to the future. Such decisions may be either (a) the selection of a broad course of action, which usually requires a marked change in operations; or (b) the determination of the means for carrying out such a course of action. The selection of a course of action may be dependent upon the means available for carrying it out. Selection of the means of action constitutes a prior decision as to the course of action to be undertaken.

The basic criterion for the evaluation of alternatives must be some concept of efficiency. An organized behavior system exists to produce

¹⁵Although there is not complete agreement among writers in the field, the selection of "routine" and "strategic" is particularly well suited to this analysis. As should become apparent in the discussion, routine decisions are similar to reorganization and strategic decisions are closely related to strategizing. For an example of other categorizations, see Robert L. Katz, The New Science Management Decisions, New York, Harper & Bros., 1955, pp. 1-3.

a surplus of satisfactions for the members over that they could secure through individual action. The best attainable ratio of inputs to outputs is the measure of efficiency.¹⁴ The ever-increasing expectations of members will direct efforts towards securing the most favorable ratio between inputs and outputs.

This agreement exists as to the ends (or goals) and as to the means available for attaining those goals, there is one decision which is consistent with optimum efficiency. In such cases, the decision to be made is likely to be routine in nature. When either ends or means are unknown or undecided, the decision will be strategic in nature, as it involves choices which will affect the basic operations of the organized behavior system.¹⁵

Functions of Decision Centers

The decision centers have several important functions to perform in the operating structure of an organized behavior system.

The function of the decision centers is the establishment of input-

¹⁴Whether the final test of efficiency is "satisfying" or "utility-maximizing" is not essential to the present analysis. Establishment of that issue is more a matter of establishing the "cut-off points" for efficiency-measuring than anything else. If the decision makers feel that they have reached the point of efficiency, with no room for improvement, this is sufficient. However, the tendency for ever-increasing expectations casts doubt on the possibility of a true "utility-maximizing" point.

¹⁵For a discussion in terms of business organization, see: Philip Selznick, *Leadership and Administration*, Evanston, Illinois, Ill., Row, Peterson & Company, 1949.

output relationships. This involves the allocation of resources among the various operations which are to be undertaken within the operating subsystem. As the members of the system themselves represent an input, the allocation process must include the division of labor and the coordination of tasks. The decision center "controls the utilization of resources of the system as a whole in the interest of the goal, and the processes by which those responsible for such decisions can exert an influence on the utilization of those resources in the interest of a goal."¹² The fact that the operative utilization of resources cannot be completely controlled from the primary decision center, except in very small operating structures, necessitates the establishment of subsidiary decision centers.

A second function of the decision centers is that of linking the operations and the members who perform those operations into an operating structure. An operating structure once established is not permanent. A change in the specific goals of the subsystem or in the resources of the subsystem will require some change in the operating structure. The allocation of resources cannot be settled indefinitely.

Even if there were a perfect organization with no problems, changes in its environment would soon create some. Not internal as well as external conditions generate change in the organization, since "inventions instituted to solve one problem . . . have a variety

¹²Elmer E. Parsons, "Suggestions for a Sociological Approach to the Theory of Organizations: I," *Administrative Science Quarterly*, Vol. 3, No. 1 (June, 1958), p. 44.

of responsiveness, some of which are likely to produce problems.¹⁹ The decision center should be the source of initiative for changing the structure to reflect operations within the subsystem, so as to maintain and, if possible, increase efficiency.

Closely related to the establishment of departmental relationships, but important enough to warrant separate attention, is a third function of decision centers. Although the operating system may appear to run itself at times, it is necessary to maintain it. Parsons and Mills have referred to this as the "integration process."²⁰ Experts must be expected upon maintaining the relationships of the parts within the system; variability in the environmental situation tends to disrupt these relationships. Additionally, it is necessary to control tendencies towards change coming from within the system.

A fourth function of decision centers is the validation of decisions made at subsidiary centers, if the latter have been established. This function results from the responsibility for decisions vested by subordinate centers which the concept of a decision center owes to his superior center. The absence of rejection implies the acceptance

¹⁹ Peter M. Blau, "Formal Organization: A Criticism of Analysis," *American Journal of Sociology*, Vol. 44, No. 2 (July, 1937), p. 37.

²⁰ Robert Parsons and Edward A. Mills (eds.), *Edward A. Shagrir, Theory of Action*, Cambridge, Massachusetts, Harvard University Press, 1951, p. 138. Also, see Samuel P. Hayes, Jr., "Behavioral Management Science," *Management Science*, Vol. 1, No. 3 (January, 1955), pp. 177-179, reproduced in: *Selected Readings in Management*, ed. Fremont Kottl, Homewood, Illinois, Richard D. Irwin, Inc., 1958, pp. 73-75.

of decisions made at subordinate centers, thereby eliminating the need for explicit approval of every decision.

Interrelationships: Operating Structure,
Communication Network and Power Structure

In the analysis of the operating subsystem which exists within an organized behavior system the attempt has been made to introduce only those relationships which involve directly three the operations of the system as it is engaged in an input-output process. Operating relationships and the operating structure, however, are closely dependent upon the communication network and the power structure which also exist within the organized behavior system. The interrelationships between the communication network and the power structure have been treated earlier. It is now appropriate to consider the basic interrelationships between all three structures.

Effective operations require that certain members of the system (those who have been designated as managers) be able to influence the behavior of others which is based upon legitimacy, rewards and sanctions in formal power. The use of power requires communication.

In general the power of a member is correlated with the extent of inputs and outputs for which he controls or influences allocation. Power over inputs gives the member influence over the assignment of tasks; i.e., the division of labor. The inputs which an individual controls is an indication of his ability to specify the input-output relationships for those inputs. A member's influence is the allocation

of outputs is directly related to his ability to control and monitor the behavior of others, which is a source of power.

As power includes not only the ability to influence others, but also the ability to act in given ways in a given class of situations, a member's position in the operating structure is correlated with his power. The greater an individual's freedom of action in the operating structure, the greater his power tends to be.

The efficiency of the input-output system is in part dependent on the effectiveness of the communication network. The coordination and direction of operations within the system requires the interchange of information between positions in the operating structure. Communication is necessary for conveying operating and instructing signals, which provide members with the information necessary for the initiation and performance of assigned tasks.

The functioning of the decision centers is influenced by the flow of information. Decisions cannot be made rationally without information about conditions in the environment and past operations. The establishment of input-output relationships in particular must rely upon feedback, which indicates the present level of operations in the system.

Further consideration of the interrelationships between the operating structure, communication network and power structure can be most successfully undertaken in connection with the analysis of managerial functions. The manager occupies a significant position in each of these structures. The functions for which he is responsible and the combination of the three structures is the subject of the following chapter.

CHAPTER VI

AN ANALYSIS OF MANAGERIAL FUNCTIONS IN CHANGING BUSINESS ENVIRONMENTS

Introduction

The purpose of this chapter is to present a framework—an integrated structure—for the analysis of managerial functions based upon a general systems approach. It is the final phase in meeting the objective of this study which is to demonstrate the usefulness of a general systems approach to the analysis of managerial functions; i.e., to explain the activity of managing as a phenomenon common to all systems at the level of human organization.

The need for such an alternative approach to the analysis of managerial functions arises from what are considered to be the inherent limitations of the "traditional approach," or that approach which is followed by the majority of current writers in the field of management and based upon the study of managing in business enterprises. These limitations are: (1) the traditionalists have not distinguished between (a) those principles which identify cause-and-effect relationships and/or facts, and (b) collections of recommendations about what practices should be; (2) the validity of the "traditional approach" and/or its conclusions has not been demonstrated, either logically or empirically; (3) the acceptability of the "traditional approach" and

its conclusions rests in large measure on frequent repetition by writers in the field and "common sense"; and (4) the universality of application sought by the traditionalists is retarded by the very nature of their approach.¹

While the general systems approach (and the analytical framework which is to be presented based on that approach) does not overcome all of the limitations attributed to the "traditional approach," it does overcome most of them.

The present analysis is not a specification of what practice should be. It is positivistic; it is designed to show the activity of managing as it occurs in human organizations. The managerial functions are viewed as the complex effort in a cause-and-effect relationship, the cause being the nature of human organizations and the operations necessary to the fulfillment of their objectives.

The careful definition of terms and explicit statement of assumptions have been consciously undertaken to permit consideration of the logical validity of this analysis. No effort is made here to demonstrate empirical validity; that task is beyond the scope of this study. The possibility of empirical validation is advanced, however, to the extent that the analysis provides a series of relevant hypotheses.

The acceptability of a general systems approach is an individual matter, which one must decide on the basis of questions such as (a)

¹Each of these limitations is more fully discussed above, Chapter I, pp. 24-28.

Is this analysis consistent with the individual's experience in and observation of organized behavior systems? (b) Does it represent a more general and more rigorous approach to the analysis of managerial functions? (c) Does it represent a more meaningful approach? (d) Does it provide a framework capable and worthy of further development?

This study should facilitate an analysis of managerial functions with universal applicability. That, in essence, is its purpose. The methodology employed in developing this framework has been suggested by General System Theorists, who seek a General System Theory which will explain phenomena common to all systems of a given type and, eventually, a grand scheme embracing all phenomena found in man's environment and experience.¹

To provide the foundation for a general systems approach to the analysis of managerial functions, it has been necessary to change the base of the analysis from the level of business enterprise to the level of organized behavior systems. The relationships among elements (numbers) of an organized behavior system were separated into three categories and each are treated in the context of a subsystem within an organized behavior system. The character of the communication subsystem, power subsystem and operating subsystem is such that certain numbers occupy especially important positions in each. An analysis of managerial functions must encompass an integration of these three subsystems, for generally such numbers are "analogous."

¹Stave, Chapter II, pp. 12-31.

The Managerial Functions

Identification of Managers

The simplest (and sometimes encountered) way to identify those members of an organized behavior system who are managers is to say that "a manager is any individual who performs the functions of a manager." This is, however, to beg the question. The descriptive truth of such a statement cannot be argued, but its value is multiple in itself.

It is essential, therefore, to identify those members of a system who are managers apart from any reference to the managerial functions. It is only after identification of those members who are managers that the analysis of managerial functions can begin. In other words, the first step is to identify "managers"; the second is to analyze what they do because they are managers.

A "manager" is any member of an organized behavior system who:

1. is recognized by other members of the system as having the power to prescribe group goals and the methods for attaining these goals;
2. is responsible for the accomplishment of these group goals;
3. is responsible for more work than one member can perform (i.e., who has subordinates responsible to him for the performance of assigned tasks);
4. makes decisions which influence the behavior of

others; and

- B. has the ability to enforce his decisions through rewards and sanctions.

Classification of Functions

Any specification of the managerial functions is a evolving process. Those individuals who are managers perform a vast number of separately identifiable tasks in the process of managing. The "functions" are classes into which similar and closely related tasks are grouped. Thus, each function refers to a wide range of tasks.

In constructing an analysis of managerial functions based upon a general systems approach, two alternatives are open. One is to assume that the generally accepted managerial functions are a "correct" classification of the tasks performed by managers in their managerial role. The other is to assume that this is not so and to seek a new classification of managerial functions.

The first alternative is adopted here. Although the "traditional approach" to the analysis is rejected, the classification of functions developed from that approach is considered to be basically sound. There is general, but not complete, agreement among writers in the field of management as how to classify the tasks which managers must perform. Various writers have adopted different major classes into which to divide these tasks.³ In this procedure is widely a matter of analytical

³Among the classifications currently popular, the following are representative:

convenience, it is doubtful that any one classification will ever be accepted unanimously.

The classification utilized in this analysis provides four classes: "planning," "organizing," "directing" and "controlling." These functions are deducible from the nature of the managerial job; i.e., the functions may be derived from an examination of the job of a "manager" explicit in the definition given above.

The framework of analysis to be presented is a demonstration of the existence of these managerial functions in the context of an organized behavior system. It represents an examination of organized behavior systems (including the construction, power and operating subsystems) to establish how and why the managerial functions are func-

(1) planning, organizing, and controlling (Joseph A. Davis, The Fundamentals of Management, New York, Harper & Bros., 1948, p. 14; also: Edwin McFarland, Management: Principles and Practices, New York, The Macmillan Co., 1948, p. 42.)

(2) planning, organizing, directing, and controlling (Michael J. Foster and William L. Schuler, Elements of Managerial Action, Homewood, Illinois, Richard D. Irwin, Inc., 1949, pp. 4-5.)

(3) planning, organizing, actuating, and controlling (George E. Terry, Principles of Management, 3rd ed., Homewood, Illinois, Richard D. Irwin, Inc., 1949, pp. 37-39.)

(4) planning, organizing, leading, and controlling (William G. Stearn and Charles E. Stearn, Jr., The Science of Management, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1949, pp. 13-14.)

(5) planning, organizing, staffing, directing, and controlling (Harold Koontz and Cyril T. Odneal, Techniques of Management, 2nd ed., New York, McGraw-Hill Book Co., Inc., 1949, pp. 15-16.)

mental to the maintenance, growth and survival of systems. In this way, the analysis of managerial functions is built upon a general structure. The generality of the analysis may be reduced through application to specific types of organized behavior systems.

The Planning Function

The function of planning includes those activities which stem from the manager's power to prescribe group goals and the methods for attaining these goals. "Planning" is the selection (from among alternatives) and establishment of group goals and the methods for attaining those goals. It is decision-making regarding future broad courses of action and means for implementing courses of action. It, therefore, is concerned with the basic determination of input-output relationships, which establish the operations which will be undertaken within the system.

The planning function is directly relevant to systemic goals, growth and survival of systems, decision centers and input-output relationships, redistribution of tasks, and interpretation and summary of information.

Systemic Goals

The systemic goals of all organized behavior systems are growth and survival. These two goals are based upon the expectations of members concerning their association with an organized behavior system. In addition to these general or universal goals, every organized behavior system

will evidence behavior directed towards the attainment of goals based upon the specific system and the circumstances surrounding its existence.

These specific systems goals, although varying from system to system, will relate to the provision of some good and/or service, broadly defined. The output of a specific organized behavior system represents the court goal; behavior within the system will be directed towards the production and distribution of that good and/or service.

The output of the specific system will be exchanged at the boundary of the system or "consumed" by the members of the system themselves. Most organized behavior systems are designed to produce an output which is exchanged at the boundary. In the exchange process, the system receives inputs and/or units of exchange, which are needed to provide satisfactions for members and to overcome oppositions. Therefore, the product of the exchange must be sufficient to reward inputs for previous operations and to insure a continuing supply of inputs to the system.

Some organized behavior systems do not rely upon the exchange of outputs at the boundary; rather their output is designed for consumption by the members of the system itself. Family social organizations, whose goal is to satisfy the social needs of its members, are of this type.

The managerial function of planning includes those activities necessary to the formulation of the specific goals of the organized behavior system or one of its subsystems. The responsibility for goals is not limited to the central manager at the national intermediate

are concerned with interpreting the subgoals of their subsystems and clustering these into subgoals for the individual members.

Growth and Survival of Systems

The maintenance and enhancement of the system's capacity for action requires planning in the form of decision making concerning the future. Plans for the replacement and acquisition of resources are fundamental to the continued operation of the system. This includes provisions for the attraction of new members to the system to replace members who leave to enhance the capacity of the system.

The selection of strategies, or combinations of activities to be undertaken within the system, is part of the planning function. Strategies related to each of the systemic goals are necessary. Decisions must be made regarding the way in which efforts to expand the capacity for action or to increase the efficiency of the system will be pursued. That the organized behavior system may be the subject of attacks, or threats of movement from other systems, requires strategies which provide courses of action for repulsing these attacks or mitigating their impact upon the functioning of the system. A manager will try to select those strategies which are most likely to forest the harshest choices in the future and which will strengthen the system where it is weakest.

The primary source of growth and survival is in the response to change in the environment. Because an organized behavior system exists in a changing environment the manager requires a continuous flow of information concerning conditions in the environment. Planning must be

related to changes in the environment so as to enhance growth through flexibility within the system and to foster survival through stability within the system.

The need for flexibility, or the capacity for relatively prompt and effective responses to change, varies with proximity to the nucleus of an organismal behavior system. The nucleus and those portions immediately around the nucleus are the source of change in the system. Therefore, they require the greatest flexibility. As flexibility is antithetical to stability and specialization, the nucleus will tend to be relieved of these nonmanagerial activities which require specialization. The greater the distance from the nucleus, the greater the degree of specialization.

Establishment of Input-Output Relationships

The selection of specific goals and the provisions for growth and survival are part of the broader task of establishing input-output relationships. The managerial function of planning may be interpreted as one of deciding how the system will produce the satisfactions the nucleus anticipates. The basic determination is reflected in the specific goals of the organismal behavior system which, in turn, are the primary consideration in the selection of the outputs which the system will produce. In establishing input-output relationships, the manager consults present resources to future expectations. It is a static process: inputs allocated in a given way and converted through determined processes will produce an output which represents the exact goals of the

systems; the attainment of these goals through the exchange or consumption of outputs will yield the satisfactions members of the system expect.

The establishment of input-output relationships may require either strategic or routine decisions. Routine decisions are those which must be made repeatedly and which can be made in essentially the same form each time a decision is necessary. Strategic decisions result in marked changes of behavior within the system and by their very nature are not repetitive.

The position of a manager in an organized behavior system will influence the proportion of strategic to routine decisions that he is responsible for making. The closer to the nucleus the larger the number of strategic decisions which the manager will make. Every strategic decision establishes parameters which will be taken into account in subsidiary decision-making. These parameters limit the possibilities open to subsidiary managers when they undertake the planning function.

Risks and assumptions are unavoidable in establishing input-output relationships. The acceptance of inputs is predicated upon assumptions regarding: (1) the ability of the system to process inputs; (2) the ability to exchange outputs; and (3) the ability of outputs to satisfactorily provide satisfactions for members of the system. These assumptions are applicable irrespective of the location of the manager within the organized behavior system. Processing of inputs always implies an assumption as to the continuity of operations. The exchange of outputs

is involved either as a fixed (boundary) exchange or as an internal exchange; in both situations, the future supply of inputs is dependent upon outputs. Failure to produce satisfactions which meet the expectations of members threatens the survival of the system or subsystem, at least in its present form.

Reinforcement of Tasks

The reinforcement of tasks is an aspect of the planning function. Reinforcement is the determination of guides for the behavior of subordinates. When communicated within the system they are in the form of instructing signals. The extent to which the instructing signal is structured is a function of (1) the point in the organized behavior system where it is formulated, (2) the importance of the activity governed by the instructing signal to the total operations of the system, and (3) the regularity with which the subject of the instruction occurs.

If the reinforcement is highly structured, with every detail provided for and an exact sequence of acts established, it provides a procedure with little, if any, room for deviation. Loosely structured reinforcement results in policy formulation; policies allow room for interpretation, while still serving as a guide to the behavior of subordinates.

Interpretation and Summary of Information

The planning function is very closely related to the interpretation and summary of messages moving through the organized behavior system.

Decision-making depends upon the receipt of new messages; it reconstitutes existing information derived from messages received from various sources; it results in the transmission of further messages.⁴

Planning depends upon the analysis, interpretation and evaluation of information. The establishment of goals, determination of courses of action and selection of means for implementing courses of action all require information about activities within the system and conditions within the environment. Events change in environmental conditions may necessitate changing the specific goals of a system. Environmental changes may mean that inputs formerly available are no longer obtainable; this will force re-evaluation of the established input-output relationships within the system. The failure of previous plans to provide satisfaction equal to the expectations of members will provide the impetus for seeking new input-output relationships.

The Organizing Function

Responsibility for more work than one member can perform requires a variety of managerial activities which may be classified as "organizing." This function is primarily one of acquisition and allocation of resources, as specified in the plan, and the establishment of formal

⁴The new messages which any unit will probably constitute operating or instructing signals. The function of such signals is more a part of the "directing" function than the planning function and, therefore, here, it is treated in the discussion of directing. *Ibid.*, p. 178.

relationships within the organized behavior system and/or its subsystems.² It involves the development of the formal communication network, the formal power structure and the operating structure, to facilitate the attainment of goals and fulfillment of plans.

The basic managerial activities included in the organizing function are: (1) the specification of tasks to be performed; (2) the recruitment and/or assignment of members to perform those tasks or groups of tasks; (3) the establishment of relationships among members; and (4) the provision of resources (non-human inputs) necessary for the performance of tasks.

The nature of the organizing function is most clearly analyzed through a consideration of the operating structure, power structure, communication structure, and the growth and survival of systems.

Operating Structure

The operating structure is the potential structure. Analytically, the creation of the power and communication structures are secondary, as the function of power and communication relationships

²Analytically formal relationships are the only type which can be established. Informal relationships are spontaneous in nature; they are formed, rather than established. To include informal relationships in the "organizing" function would be to treat them as formal. If one wishes to do so, he may consider the informal structure in much the same way as the formal. The basic differences are in the power structure. Power-holders in the informal structure possess informal, rather than formal, power. This procedure may be tested by assuming that the "leader" of the informal group is the "manager" of that group. If the informal group has permanence, the leader will be a manager in the proper sense of that term.

are in large part determined by the operating relationships which constitute the operating structure.

The throughput of matter is the basic source for the structuring of relationships within the system, as it is the conversion of inputs and distribution of outputs which ultimately result in the provision of satisfactions to meet the expectations of members.⁴ Therefore, the logical starting point in the derivation of relationships among members of the system is with those relationships necessary to the input-output relationships developed under the planning function.

The operating relationships link operations and the members who perform those operations into an operating structure. The allocation of tasks and resources to members cannot be completely controlled from the nucleus of an organized behavior system, except in very small systems. The force which requires the creation of subsidiary decision centers and secondary allocations is the limit of one member's capacity for action.

The structuring of the specific systemic goals into subgoals which are assigned to operating units specifies the functions of these units in relation to the total functioning of the system. The goal-structuring

⁴It is recognized that in some types of organized behavior systems the relevant inputs and outputs would not be material in nature. Some types of systems are concerned with intangibles, such as creative thought, socialization or persuasion. Such systems would involve "non-material throughput." Analytically, however, it is easier to visualize a "throughput of matter" and that expression will be used for analytical convenience.

process must be initiated by a resource-allocating process, if units are to fulfill their functions. At each major successive step in the allocation process a decision maker is created. This decision maker is coupled by a manager who is responsible for another secondary allocation of both goals and resources.

The distribution of the total number of tasks to be performed among members of an organized behavior system requires the division of labor. The basis selected for the division of labor will depend primarily upon the nature of the output.

In this way, three processes occur simultaneously: the allocation of goals, the allocation of tasks designed to meet those goals, and the allocation of resources with which to perform those tasks.

The development of the operating structure requires both horizontal and vertical relationships. Horizontal relationships link members in a work-flow or in the joint production of output. In the work-flow kind of horizontal relationship the output of each member moves to the next, who performs certain operations before passing it onto the next, and so on.⁷ In the joint output kind of horizontal relationship the interdependence is such that the total output depends upon each member completing his share of the output. Vertical relationships link

⁷Close to the center of the organized behavior system the horizontal relationships are not so clearly identified with work-flow. The participants of performing operative (non-managerial) tasks distribute to one another closer to the center. Therefore, the managers close to the center exchange less tangible forms of output than those further removed from the center.

members in the operating system to a manager who holds formal power.

Formal Structures

The vertical relationships, although part of the operating structure, are maintained through the possession of formal power by the member holding the superordinate position. The manager, who is responsible for the quantity and quality of coordinated group effort, seeks to influence the behavior of his subordinates in the performance of tasks necessary to the accomplishment of goals.

The vertical relationships link the formal power-holders into a hierarchy of power positions. The need for these positions within the organized behavior system arises from creation of an operating structure which requires the allocation of tasks through the division of labor. The task-allocation process requires a power-allocation process. The assignment of tasks to members of the system must be accompanied by the delegation of power to perform those tasks. Insofar as the members involved are managers (those tasks include responsibility for the performance of others) it is necessary that they possess formal power to influence (direct and control) the behavior of other members in the system.

The power relationships which link members of the system into a formal power structure are established through the decentralization of formal power. Starting at the nucleus of the organized behavior system, successive delegations of power are made to members of the system. Members of the system at the fringe will be the ultimate subordinates,

holding formal power to influence the behavior of other members of the system.

The exercise of the power relationship is directly related to the input-output relationships upon which the operating structure is based. Control over inputs is likely to determine the number of subordinates a manager has; control over outputs provides the means for rewarding behavior of subordinates which is in conformity with the intentions of the power-holder.²

Communication Network

The organizing function of managers includes, in addition to the specification of operating and power relationships, the establishment of communication relationships.

The network of communication relationships provides a structure for the transmission of information throughout the organized behavior system. The members of the system must be linked for communication purposes; it is only through communication that power and operating relationships may be exercised.

Earlier it has been stated that the communication network will not be completely co-extensive with the power and/or operating structures. All members of the system who are linked through these latter types of

² A rough approximation of the power which a member possesses may be made, therefore, based upon the number of members whose behavior he controls (directly and indirectly) and the amount of resources for which he controls or influences allocation.

relationships must perhaps be linked in corresponding communication relationships. However, some communication relationships parallel horizontal operating relationships which do not involve power relationships (which parallel vertical operating relationships). Additionally, communication relationships in some cases will be used to link formal power-holders vertically without including all intermediate power-holders.

A chain of communication relationships has been referred to as a "channel." Viewed in its totality, the communication network is based upon numerous channels which are designed for the transmission of various types of messages. Certain members within the channel will be responsible for the storage, transmission, interpretation and/or collection of information. Thus, it is possible that the only operation assigned to some members will be communicative ones; i.e., the basic inputs and outputs relevant to their tasks will be messages.

Another consideration in the establishment of the communication network is that of providing for the minimization of noise and distortion. Noise may be reduced through providing clear channels of communication which link members of the system through a minimum number of intermediary members. Distortion may be reduced through the provision of channels which by-pass certain power-holders without reducing their effectiveness in the operation of the system. The minimization of distortion is especially important in connection with the channels of communication which supply information to the nucleus.

Growth and Survival of Systems

The structures which are established in the regulated behavior system through performance of the nonproportional function of organizing have a significant effect upon the system's ability to grow and survive.

Increases in the system's capacity for action (growth) requires an adjustment of the structures within the regulated behavior system. Growth changes the relations of the parts of the system. The influence of growth upon the regulated behavior system's structures may be interpreted in terms of the principles of growth.⁹

From the principle of non-proportional change it is clear that structural reorganization must be made for increases in capacity. And here must be added to the existing structures without changing the existing relationships within the system. The proportion of activities necessary to keep the regulated behavior system operating will increase with growth.

This condition leads to the formation of "stiff" and "survivor" units which are designed to solve and/or avoid the problems attending growth. Stiff and survivor units are specialized subsystems responsible for the performance of activities fundamental to the continued operation of the system. They will be established to relieve the remainder of the regulated behavior system of those activities which are essential to the survival of the system, but not directly connected with the

⁹These have been discussed in detail above, Chapter III, pp. 68-69.

throughput of action.

For example, the attraction of new members to an organized behavior system to increase or maintain the capacity for action may be assigned to a personnel department. A department specializing in the performance of this task can perform it for the system as a whole, alleviating the need for each operating subsystem to do so.

The principle of evolution stresses the need for continuing review of the structures within the system. At the present time of the system is a reflection of previous growth, the relationships existing at any given time are to some extent based upon conditions which are no longer pertinent to the functioning of the system. Recognition of this will direct efforts to adjusting the structure to reflect current needs.

The principle of adjustment to variability will also be reflected in the organizing function. It may imply adjusting new elements to the structure of the system or adjusting the structure to the new elements. The extent of action potential will depend upon the overall size of the organized behavior system and the technology applicable to the operations of the system. The larger the system and the more the applicable technology limits variability, the more likely it is that elements will be adjusted to structure.

Survival of the system is dependent upon the structuring of relationships within the organized behavior system. In organizing the manager must seek to balance flexibility with stability. Excessive specialization and/or an imbalance of structure may lead to pathological

conditions. The importance of balance will serve to restrain the inclination towards specialization, which reduces the ability of the system to respond to changes in the environment.

The Director Function

Certain activities, which result from the manager's responsibility for decision-making and his responsibility for more work than one member can perform, are classified under the function "directing." "Directing" is influencing the behavior of others in the direction of plans. In terms of superior-subordinate relationships, it is a matter of providing guidance and supervision through interpretation, instruction and explanation of plans. Directing is essentially a communication phenomenon. Through communication the manager seeks to coordinate activities within the relationships established through organizing and to maintain them with the plans.

Influencing Behavior of Subordinates

In directing, the manager will issue operating signals to initiate and/or terminate action by his subordinates. Limits upon the formal power of the manager will restrict the freedom which he has in issuing operating signals. The signals have an effect upon the receiver's possibilities of choice.

Directing also includes the issuance of instructing signals which are messages designed to teach members of the system how to interpret

operating signals which they will later receive, what action should be taken upon receipt of various kinds of operating signals and what answering signals should be initiated during or upon completion of action. The effect of instructing signals is upon the receiver's efficiency of action.

The standardization of instructing signals centers in the planning function in terms of the formulation of policies and procedures. These are communicated to members of the system to guide their future actions. Once communicated they specify how certain activities shall be undertaken within the system or what considerations should be given before proceeding with action.

Definition

A direction (operating or instructing signal) is more or less influential according to the response it elicits from the receiver. The measure of the effectiveness of the signal is the activation which it provides for subordinates to take (or not take) action in accordance with the intentions of the sender. The motivational quality of the message is an indication of its ability to stimulate action.

In performing the directing function the manager must, therefore, communicate more than his intentions. It is also incumbent upon him to communicate how the completion of the desired action will lead to the satisfaction of the individual member's goals. In some cases this will be implicit in the direction, illustrating the need for direct specification of reward for performance. In other cases it may be

caused by the manager, but not recognized by the subordinate, in which case the effectiveness of the signal is diminished.

In some instances members of an organized behavior system may voluntarily seek to alter the model of behavior knowingly or unknowingly established by the manager. If so, a manager may secure greater confidence to his intentions than he anticipates or directly seeks to stimulate. Such voluntary initiation tends to decrease the members' identification with the organized behavior system and the stability of the system.

The power of the manager to reward or sanction the behavior of his subordinates provides the basic mechanism for activation. Unless the necessity for the possession of power by certain members of the system has been presented, the abuse of power by the power-holder will reduce the over-all potential for survival of the system. Members will continue in association only so long as they anticipate the satisfaction of their goals through participation in the system. The eventual inability to replace members will limit the growth and survival of the system. Therefore, the manager will seek to avoid the abuse of his power and to promote his ability to effectively influence the behavior of his subordinates. His power to act is dependent upon the survival of the system; he cannot anticipate fulfillment of his personal aspirations if the system ceases to exist.

The Sustaining Function

In fulfilling his responsibility for accomplishment of group goals,

the manager must undertake that class of activities which may be referred to as "controlling." In "controlling" the manager seeks to coordinate and regulate action within the established relationships to conform with plans. It is assumed in controlling that the performance of operations within the system in accordance with plans should result in goal attainment. Records and corrections provide the manager with the means for controlling the behavior of members in accordance with his directions.

Feedback

The controlling function is entirely a communication phenomenon, which explains the operation of the feedback concept. It will be recalled that "feedback" is the return of information about the output at one stage of a process to an earlier stage so as to influence its actions and hence to change the output itself.

The controlling function involves those activities necessary to acquiring information about the output of current activities, comparing that information with standards of performance (which are derived from the statement of input-output relationships and from directing), and instituting corrective action, if necessary.

The effectiveness of the controlling function is dependent upon the structure of communication relationships which has been provided in fulfillment of the organizing function. In order to control, the manager must receive an inflow of messages concerning conditions within and without the system.

The flow of messages to the manager is designed to provide the information needed to evaluate conditions. The communication and interpretation of information and the combination of messages from various sources is necessary. The end result of this process is an appraisal of current conditions. The appraisal must then be compared with predetermined standards to establish the significant deviations, if any.

The presence of significant deviations leads to the initiation of corrective action. The apparent source of the deviations will determine the nature of the corrective action to be taken. Failure of action to meet expectations may indicate a weakness in planning, organizing or directing. As plans involve estimates of future conditions, the misestimation of these conditions can be the source of deviations. Deviations may result from an improper structuring of processes within the system and/or the failure to obtain inputs to the quality and quality specified in the plans. The deviations may be a reflection of inadequate direction, operating and instructing signals having been too weak to stimulate the intended action. Finally, the deviations could occur through a lag in the flow of information through the specified channels so that information reaches the manager only after the deviations have reached significant dimensions.

Feedback Technology

In addition to controlling specific courses of action underway within the organized behavior system, the controlling function en-

compensate activities to prevent pathological conditions from destroying the system. The controlling function includes giving attention to those types of self-orienting and instituting action to stem their advance.

As an organized behavior system grows the necessity for holding it together becomes one of the most important problems facing the manager in the system. A rate of growth must be maintained which is such that adjustments can be made to increases in capacity while at the same time maintaining equilibrium within the system. Otherwise the system may disintegrate even though it is experiencing growth.

Maintenance and reinforcement of the structure of the system is necessary, with or without growth. An organized behavior system seldom exists in a static environment. Changes in the environment necessitate maintaining the system's structure while adjusting to these changes. Even if there were no changes in the environment, it would still be necessary to control tendencies within the system to drift from established relationships.

Feedback about power relationships is necessary to detect the development of internal conflicts as attempts by a member to modify his status in the power position. Either eventually is generally an indication of weakness in the direction process.

Providing for feedback loops independent of the power structure is necessitated by the potentiality for noise and/or distortion when communication channels are co-terminous with power chains. Independent loops reduce the potential for interference with the content of messages

and may also reduce the time required for communication.

Conclusions

The preceding discussion represents a framework for the analysis of managerial functions based upon a general systems approach. An analysis of functions should be concerned with "what" and "why" and not with "how." The emphasis has been upon what functions are inherent upon the managerial position and why they are so.

No attempt has been made to describe the "how" aspect. How a manager performs his functions represents the utilization of techniques. Describing about techniques is clearly beyond the scope of this study. The techniques which a manager will employ in performing the managerial functions are dependent upon the nature of the organized behavior system of which he is a member. The nature of the system, including the character of its members, its specific goals, its environment and its input-output processes, will have to be taken into account in specifying the appropriate techniques.

The framework presented has tended to emphasize the multiplicity of relationships which will occur in organized behavior systems. These relationships are of two types: those which link inputs and outputs, and those which link members in the system. Relationships among members originate for three purposes: communication, power and competition. The establishment of relationships is part of the planning and organizing functions.

The directing and controlling functions are relatively less con-

plex than the planning and organizing functions from the analytical viewpoint. This is not to imply that directing subordinates by influencing their behavior or that controlling activities within the system are simple. Rather it is a recognition of the nature of these functions. The way in which a manager seeks to activate his subordinates, however, is one of technique not function. Likewise, the controlling function is largely a matter of selecting the techniques for executing that function. Analytically, controlling is a process which relies upon the use of information supplied through feedback circuits to coordinate and regulate action within the system.

The functions of a manager are considered to be implicit in human organizations; wherever people are organized to attain some objectives the need for managing is present. Furthermore, all managers will perform the same functions, regardless of the nature of the specific organized behavior system or their position within that system. The proportion of their attention that is given to various functions will, however, vary. The size of the system, the nature of its inputs and outputs, and the position of the manager in relation to the total system will govern the relative importance of each function to the total contribution of a manager to the success of the system.

The managerial functions have been presented in what is considered to be their natural sequence of occurrence—planning, organizing, directing and controlling. This is possible both analytically and synthetically, if only one sequence of managerial behavior is assumed.

In an organized behavior system a manager performs all of these functions and without any significant distinction between functions. The nature of organized behavior systems, the managerial problems in these systems and the functions themselves are such that a very great degree of interdependence exists among the functions. A natural sequencing of functions does not exist and any analysis of managerial functions must therefore rely upon an artificial classification of the relevant tasks.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Objective of This Study

The objective of this study has been to demonstrate the usefulness of a general systems approach to the analysis of nonperiodical functions. Utilizing the methodology of General System Theory, this study was designed to provide an explanation of the activity of managing in the context of a phenomenon common to all systems at the level of human organization.

General System Theory was proposed in 1955 as a new discipline which would be concerned with the formulation and deduction of those principles which are valid for systems in general. The purpose of General System Theory is to develop a science using common elements found in all systems as a starting place. The nature of the Theory is such that it strives to form a bridge between the highly specialized theories of specific disciplines and the highly generalized theory of pure mathematics. In search of such a discipline, all areas of man's experience and environment are within the scope of General System Theory. The development of a General System Theory may be based upon (I) the identification of those phenomena common to all systems and the formulation of general system laws which explain the operation of

these phenomena; or (i) the classification of all systems into a hierarchy of systems based upon the complexity of the systemic elements and the development of an analysis for all phenomena which occur at each level.

The fundamental conception of this study has been that the activity of managing is implicit wherever one encounters people organized to attain some objective. A body of knowledge, which may be referred to as "management," has evolved which attempts to explain "managing," the process of getting things done through others.

The currently widely-accepted analysis of managerial functions is the result of efforts, primarily by social scientists, to describe and analyze the work which distinguishes managers from non-managers. Because of the similarity in their approach, current work in the area has been termed the "traditional approach."

The "traditional approach" begins by asking (and attempting to answer) questions such as: (1) what is management; (2) who is a manager; and (3) what functions do managers perform? The analysis is then based upon the study of business enterprises and the influence of the business environment permeates the entire presentation. The traditionalists maintain, however, that their analysis is capable of universal application; i.e., the managerial functions will be identifiable and the principles of management will be operable in any type of organization.

The need for an alternative approach to the analysis of managerial functions arises from what are considered to be the inherent limitations of the "traditional approach." These are (1) the traditionalists

have not distinguished between (a) true principles which identify cause-and-effect relationships and/or facts, and (b) collections of recommendations about what practice should be; (2) the validity of the "traditional approach" and/or its conclusions has not been demonstrated, either logically or empirically; (3) the acceptability of the "traditional approach" and/or its conclusions rests in large measure on frequent repetition by writers in the field and "common sense"; and (4) the universality of application sought by the traditionalists is retarded by the very nature of their approach.

A universal analysis of managerial functions must be based upon a universal foundation. The "traditional approach" avoids a universal analysis on a limited foundation which weakens the contribution and diminishes its usefulness. Hence, the first step in this study was the provision of a universal or general foundation.

The premise of a general systems approach to the analysis of managerial functions lies in shifting the base of the analysis from a "unit of business enterprise" to the level of "organized behavior systems."

An "organized behavior system" is a group (two or more individuals linked together by positive expectations concerning the outcome of their association) taken in conjunction with the environment in which the group operates and has its being, including the instruments and resources utilized by the group, as a group.

Growth, Growth and Survival of Organized Behavior Systems

The origin of organized behavior systems can viewed in terms of (1) individual goals and competition, and (2) association and systemic goals. The goal-oriented behavior of an individual is a function of the needs acting upon that individual at the time. Man's needs are such that they are never fully satisfied. Because of the scarceness of man's needs relative to resources, he must compete with others for the acquisition, utilization and retention of resources. Satisfaction for some of man's needs requires association with others; other needs may be satisfied, at least in part, through association. A natural tendency to associate with others, which also results from man's recognition of the superior effectiveness of group efforts, is therefore observable.

Associations, as organized behavior systems, also display goal-directed behavior. Because they are applicable to all organized behavior systems, the goals of growth and survival have been termed "systemic goals." Every system exhibits behavior oriented to the attainment of these goals.

The motivation for growth (increase in the capacity for action) is a reflection of the goals of the individuals who compose the system. As members of a system have ever-increasing needs, the growth of the system is necessary to meet these increased expectations. The growth of organized behavior systems can analyzed in terms of the principles

of structural growth. These principles explain why the structure of a system must reflect increases in the capacity of the system.

For a system to survive, the activities undertaken within it must result in the fulfillment of the expectations of its members. The selection of effective strategies (the way in which a combination of activities is to be undertaken) is one of the conditions of survival. The selection of strategies is closely related to the system's ability to respond to changes in its environment. Anticipation of growth may be sufficient to hold the system together for relatively short periods of time. Survival of the system is also a function of the degree of stability and continuity of relationships with the system.

Malfunctioning of organized behavior systems has been treated in this study as "systemic pathology." The principal pathological conditions of organized behavior systems are: (1) excessive expectations of members; (2) attempts at aggrandizement of power by certain members of the system; (3) internal conflict among members; (4) misestimation of the capacity of the system; (5) imbalance of structure; (6) excessive specialization of the members or of the system as a whole; and (7) the substitution of ideology for information.

The Integrative Function

The interactions and interdependencies among the elements of a system result in the formation of relationships which tie the system together. The relationships among elements (members) of an organized behavior system were separated into three categories: communication relations

ships, power relationships, and operating relationships. Each one isolated and treated in the context of a "subsystem" which exists within an organized behavior system.

"Communication" is the transmission of a sign or signal and its interpretation by the recipient. It includes all procedures by which one can elicit any effect another, or by which one person may affect the behavior of another. The pattern of communication relationships which link members of the system for communication purposes and which are relatively stable and continuous form a "communication network."

All messages consist of information and interference. "Information" is the true content of the message. To the sender, information is a measure of his freedom of choice when he selects a message. To the receiver, it is that part of a message which could not be predicted in advance. Information transmitted within an organized behavior system can be divided into four types: (1) operating signals, which initiate or terminate action; (2) monitoring signals, which indicate that an operating signal has been received or which report the state of a particular operation; (3) instructing signals, which are intended to prepare members for other signals; and (4) social signals, which are intended to establish the conditions needed for transmission. The interference portion of a message may be "noise" or "distortion." Noise is accidental interference, while distortion has been defined as deliberate interference.

"Feedback" is the return of information about the output of one

stage of a process to an earlier stage so as to influence its actions and hence to change the output itself. Effective communication requires feedback; in fact, communication can be viewed in terms of feedback circuits or loops.

The communication network provides a structure of relationships for the transmission, reception, storage, communication, interpretation and processing of information. In almost all systems within an organized behavior system requires some form of communication. The effectiveness of the communication network is vital to the proper functioning of the system.

The Power Dimension

Many writers have attempted to distinguish between "authority" and "power," basing the distinction upon differences in the sources of each concept. Attempts to resolve this issue have not been successful. Therefore, the approach taken in this study has been to distinguish between "factual power" and "infernal power," setting authority aside as a concept not beneficial to this analysis.

"Power" is the ability to act in given ways (in a given class of situations) and/or the possession of controlling influences over others. All members of an organized behavior system are linked through power relationships.

The sources of power were identified as (1) attraction, (2) impersonalism, (3) ability to reward, (4) ability to punish, and (5) perception of legitimacy. "Factual power" is based upon legitimacy, rewards

and emotions; "informal power," upon attraction and expertise.

Each type of power gives rise to power relationships. The pattern of power relationships which are relatively stable and continuous over a period of time has been referred to as a "power structure." An organized behavior system will have one formal power structure and most will have a number of informal power structures, with both types of structure co-existing within the system. In formal power relationships are the only type which can be established (in contrast to informal relationships which are formed more or less spontaneously) the analysis of managerial functions must be concerned primarily with formal relationships.

The Operating Subsystem

Interaction among members of an organized behavior system can also be considered in terms of operating relationships which result from the establishment of the operating structure. The operating subsystem is concerned with the inputs and outputs of the system, and the structuring of processes within the system to achieve anticipated goals, approaching efficiency.

The terms "inputs" and "outputs" were used to refer to the terminal points of any operating process, including those which occur at the boundary of the system. The relationships established between inputs and outputs to achieve systemic goals are fundamental to the establishment of operating relationships.

The assignment of activities necessitated by the input-output

relationships involves the division of labor and the verification of tasks. "Division of labor" can be used to refer to any method for dividing the work to be performed within the system. Division of labor may be based upon type of input, stages of the process, segments of output, discrete numbers or spatial sequences. An effective division of labor requires "verification," or the establishment of specified procedures for the performance of activities which occur regularly and repeatedly within the system.

The basic element of structure within an organized behavior system is the individual member. The limit of one member's capacity for action is the force which requires the creation of subgroups and the establishment of "decision centers" within the operating structure. A decision center is accepted by a member who is responsible for more work than one member can perform. The functions of decision centers are: (1) establishment of input-output relationships within their sphere of operations; (2) linking operations, and the members who perform those operations, into an operating structure; (3) maintaining the operating structure once it has been established; and (4) exhibiting decision-making at subsidiary centers.

The Analysis of Hierarchical Functions

The communication network, the power structure and the operating structure occur simultaneously within an organized behavior system. An analysis of hierarchical functions must encompass an integration of

these three subsystems. The character of each is such that certain members of the system occupy especially important positions in all of them at the same time; generally, such members are "managers."

A "manager" is any member of an organized behavior system who (1) is recognized by others as having the power to prescribe group goals and methods for attaining these goals; (2) is responsible for the accomplishment of these group goals; (3) is responsible for more work than one member can perform, i.e., who has subordinates responsible to him for the performance of their assigned tasks; (4) makes decisions which influence the behavior of others; and (5) has the ability to enforce his decisions through rewards and sanctions.

Any specification of managerial functions is a process of classification. Even though various questions may be raised about the approach itself, the classification developed from the "traditional approach" is basically sound. The classification utilized in this study involved four classes: planning, organizing, directing and controlling. These functions are definable from the job of a manager.

The analysis presented in this study is a demonstration of the existence of these functions in the context of an organized behavior system. In this way the analysis of managerial functions has been placed upon a general foundation. Furthermore, it indicates the necessity for "managing" in all human organizations.

"Planning" includes activities which result from the power to prescribe group goals and the methods for attaining these goals. It is

the selection from among alternatives and the establishment of group goals and methods for attaining those goals. Planning involves decision-making regarding future broad courses of action and means for implementing courses of action. It is the determination of the operations which will be undertaken within the system in terms of input-output relationships.

Responsibility for more work than one member can perform requires those managerial activities classed as "organizing." This function is primarily one of the acquisition and allocation of resources and the establishment of formal relationships within the organized behavior system and/or its subsystems. It involves the development of a communication network, a power structure, and an operating structure to facilitate the attainment of goals through fulfillment of plans.

Certain activities which result from responsibility for more work than one member can perform and from decision-making are classified under "directing," or the influencing of the behavior of others in the execution of plans. In terms of superior-subordinate relationships, it is a matter of providing guidance and supervision through interpretation, instruction and explanation of plans.

In fulfilling his responsibility for accomplishment of group goals, the manager must undertake activities which have been referred to as "controlling," or monitoring and regulating action within the established relationships to conform with plans. Controlling assumes that the performance of operations within the system in accordance with plans will bring goal attainment. The basic mechanism for controlling

the behavior of members in accordance with directions is the manager's ability to reward and sanction. The concept of feedback developed in the analysis of communication provides the starting point for the analysis of controlling.

Implications of The Study

The objective of this study has been to demonstrate the usefulness of a general system approach to the analysis of managerial functions. The development of a general analysis has many implications for the "traditional analysis" and for the emerging discipline of General System Theory.

Insofar as this study has achieved its objective, it provides an analysis of managerial functions which is not limited to business enterprises, or any other specific type of organized behavior system. Acceptance of this analysis does not require absolute rejection of the traditional analysis based upon business enterprises, for the two are complementary. The interchange of concepts between the two may very likely improve both.

This study was designed to provide a framework; opportunities for reformulation, improvement and expansion abound. There may be misunderstanding, in the attempt to explore relationships in greater depth or to identify other pertinent relationships, or empirically, to test the applicability of this analysis to specific systems. The significance of this study should be measured in terms of its initiation of new avenues for research, not in terms of its completeness of

perfection.

This study also has implications for the development of a General System Theory. Mapping is one of the fundamental phenomena in all basic explanations. Completion of the level of social systems requires an analysis of nonspatial functions. This study contains an attempt to provide such an analysis. Furthermore, the integration of the social sciences (which is also a prerequisite to completion of the level of social systems) has been advanced to the extent that this analysis provides a framework for the synthesis of those portions of economics, political science, psychology and sociology which are directly relevant to the activity of mapping.

Completion of a General System Theory requires completion of the level of social systems, as well as all other levels. To the degree that this analysis aids completion of the level of social systems, it advances the evolution of a General System Theory.

The importance of the development of a general systems approach to the analysis of nonspatial functions, as well as a General System Theory, has more than philosophical significance--for, as Kurt Lewin has said, there is nothing more practical than good theory!

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BIOGRAPHICAL SKETCH

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This Dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Business Administration and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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